PREDICTING "PROTOTYPE" INTERACTIVE TELEVISION USE IN A CONTEMPORARY MEDIA ENVIRONMENT: AN INNOVATION-ADOPTION MODEL

By

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A DISSERTATION PRESENTED TO THE GRADUATE SCHOOL
OF THE UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

UNIVERSITY OF FLORIDA

2003

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To my wife, Kwiryun

ACKNOWLEDGMENTS

First and foremost, I would like to express my gratitude to my dissertation committee chair, Dr. Chang-Hoan Cho. Without his careful instructions, my dissertation would not have been possible. He encouraged me to overcome all kinds of difficulties throughout the writing of this dissertation. I would like to thank Dr. Sylvia M. Chan-Olmsted, who was my advisor during my doctoral studies. From her, I learned not only how to conduct research, but more importantly, how to live in my life. She taught me life's great lessons that I will keep in my mind during the rest of my life. .

My thanks are extended to the other members on my committee: Dr. Lynda Lee Kaid, Dr. Marilyn S. Roberts, and Dr. Barton Weitz. Dr. Kaid and Dr. Roberts generously shared with me their knowledge on research methods and communication theories. Dr. Barton Weitz, who is an outside member on my dissertation committee, provided much helpful advice for me to advance marketing fields. Their positive attitudes toward me always mad me feel happy. I must thank Dr. John Wright, II, who accepted to be a substitute professor for Dr. Kaid and gave me valuable comments on my dissertation. In addition, I gratefully acknowledge a research grant from The Cable Center (The Magness Institute). I especially appreciate Dr. Mike Wirth (senor fellow of The Magness Institute) for his concerns and interests in my research.

I owe special thanks to my family. My wife, Kwiryun Kim, went through every stage of my study abroad with me. Her warmth of endless love enabled me to complete my dissertation successfully. My parents always believed in me during my stay in the

U.S., while supporting me emotionally, spiritually, and financially. I am also grateful to my parents-in-law, my sister, Youngsun, and my brother, Kiwon, for their heartfelt encouragements.

I would like to say thank you to my fellow doctoral students for their help and support, Jangyul Kim, Hyoungkoo Khang, Byenghee Chang, Seung Eun Lee, Daphne Landers, Steve Marshall, Hongsik Cheon, and Eyun-Jung Ki. Inmyung You, Jong-Hyuk Jung, Yang Hwan Lee, and Yoonserk Pyun will stay in my mind with unforgettable memories in Gainesville. I also thank my colleagues, Samsup Jo, Jaemin Jung, and Jooyoung Kim, for their helpful comments and suggestions. I want to give special thanks to Jin Young Tak (visiting professor) for guiding me through difficulties. Lastly, I would like to thank my best friends, Kiyoung Lee and Eunkyu Park, for their unwavering moral support.

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Abstract of Dissertation Presented to the Graduate School
of the University of Florida in Partial Fulfillment of the
Requirements for the Degree of Doctor of Philosophy

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December 2003

Chair: Chang-Hoan Cho
Major Department: College of Journalism and Communications

The fast growth of high-speed Internet access and digital satellite services has intensified competition for consumer adoption of media and communication products and services. In this competitive environment, interactive television (ITV) has gained appeal because of its essential characteristic (interactivity). My study aimed to identify consumers' actual demand for ITV. I first attempted to define an ITV prototype and then explored predictors that affect potential consumer (or media user) intent to adopt the ITV within the context of competing media (i.e., existing television services, the Internet, videocassette recorders, digital video disc players, and video game consoles). A nationwide mail survey was conducted in the United States. My study had a 23.5% response rate, yielding a total sample size of 332 participants.

Results showed that three primary motives for adopting an ITV prototype: controllable viewing, multitasking, and advertisement intrusion. These motives (or

benefits provided by the future ITV) were significant predictors for intent to purchase or use the ITV in the near future. I also found that ITV was perceived as a *substitute* for existing television services and videocassette recorders, while ITV was perceived as a *supplement* for the Internet. The perception about ITV's functional substitution, however, did not affect the intent to adopt ITV, contrary to what the study anticipated. Perceived behavioral control (i.e., resources, complexity, and technical matters) most strongly influenced intent to adopt ITV. Especially, perceptions about available resources (i.e., affordability and intrinsic value) for purchasing ITV in the near future differed most between potential non-innovators and innovators.

Based on these findings, my study could help ITV content providers and distributors (including cable operators) develop new functions and verify the marketability of various service models. Results suggest that ITV-associated firms should develop a package that consists of existing ITV services (i.e., video-on-demand and personal video recorder services) and Internet access service, as a potentially profitable ITV combination.

My study partially supported a functional similarity principle using a concept of perceived functional substitution. Inconsistent with innovation adoption literature, the study implied that the most influential factor in increasing or delaying the adoption rate of an innovation may be the perceived control over an innovation adoption, rather than attitudinal motives for the innovation. Most of the demographic variables in my study were not related to the adoption of ITV, unlike other technologies examined in the previous studies.

CHAPTER 1
INTRODUCTION

This chapter first explains fundamental reasons why my study is now necessary in media and communication fields. In addition, an interactive television (ITV) prototype is introduced, along with a definition of interactivity for the ITV. Lastly, this chapter states the purpose of my study.

Convergence and Competition

The ongoing convergence of media and communication technologies necessitates reconceptualizing consumer choices of traditional and new media (Henke and Donohue 1989; Lin and Jeffres 1998). Telephone, cable, broadcast and computer technologies (relatively independent in the past) are merging into a single interface in the information superhighway system (Baldwin et al. 1996; Pagani 2000). Interactive television (ITV) is an example of converged formats or vehicles in an integrated broadband system. Through a one-window or dual-window TV screen, television programs and Web contents can be viewed simultaneously.

Video-streaming on the Web is a converged type of television and the Internet, too. It is streamed from a server to an end user in response to the user's request for a Web site containing embedded television programs. Online multiplayer or roleplaying games also are converged and enhanced types of game consoles and the Internet. As various converged types of media services grow, competition intensifies among a variety of media sources for consumers' service choice or adoption, and the media industry evolves accordingly (Chan-Olmsted and Kang 2003).

With such intensified competition, the cable industry faces drastically decreased numbers of subscribers to cable services, as well as a reduction in profitability. For example, the industry faces fierce competition from digital satellite providers, who are luring away existing cable subscribers. Satellite providers carved out as many as one million cable subscribers in 2002 (Grover and Lowry 2003). Moreover, the drastic collapse of cable stock values has pressured cable operators to increase per-subscriber revenues and to reduce churn while maintaining operational costs (Adams et al. 2002).

New Interactive Applications

Newly converged media and the rapid growth of digital satellite services make it harder for cable operators to retain customers and attract new ones. The market is growing for new television services, such as enhanced television features on the Web and video streaming using the Internet Protocol (IP). In addition, consumers' responses to media services are changing. For instance, physical and psychological distances between television and the Internet are narrowing for today's consumers (Lin 1999).

To counter this situation, cable operators are actively deploying video-on-demand (VOD) and testing personal video recorders (PVRs) for ITV services. The VOD service is a more advanced form of pay-per-view programming service, which enables viewers to order and watch movies on demand. The PVRs are VCR-like devices or applications (such as TiVo and ReplayTV) that let users record, store and play back programming by using computer hard drives in a set-top box or at a head end.

Cable operators such as Time Warner and Insight have put a lot of effort into VOD because they think it is a great weapon against satellite TV (Mediapost 2003). They hope that the VOD reduces cable service churn rates, via cable's competitive advantages over digital satellite providers, and the PVRs also enhance consumers'

experiences and increase their interests in interactive services. It is, however, uncertain how much these services will reduce churn and stimulate interactive services.

In fact, the VOD service has been viewed as not being economically viable in the near future, because of its dependence on repackaged content from major programmers (rather than on innovative, original VOD programming) (Jupiter Media Metrix 2001; JMR 2002a). The PVRs seem unsustainable as a revenue model, even if some pure-play companies (like TiVo) charge a fee for interactive features such as electronic program guides (Adams et al. 2002). Given the limitations of VOD and PVRs, cable operators must develop new valuable and profitable applications or content.

Meanwhile, little academic research has been centered upon consumers' adoption of ITV in the U.S. Early research on ITV concentrated on the effects of instructional television on people. This type of research is not sufficient to predict the growth potential of the ITV market because the research is limited to the effects of ITV on educational subjects. A few researchers, on the other hand, investigated ITV consumer demand for and potential use of ITV (Beckman 1996; Offutt 1982). Some researchers predicted the U.S. market for interactive narrowband services, such as WebTV and AOLTV (Kerschbaumer 2000; Thielmann and Dowling 1999). These initial studies also appear to be inappropriate in understanding consumers' needs for (or perceptions about) an ITV prototype, due to recent technological advances such as broadband infrastructure, high-speed Internet services, etc.

Thus, my study raises one essential question: what, if any, new interactive applications or content can contribute most effectively to increasing the penetration of

cable services in the near future? In addressing this question, it is necessary first to determine consumer demand for ITV services.

Interactive Television (ITV) Prototype

Generally, a product prototype is built on a variety of previous industrial analyses. Likewise, an ITV prototype is created for my study, by outlining a spectrum (or grid) of characteristics obtained from previous industrial reports (Greenspan 2002; Pastore 2002; 2001; 2000; Swedlow 2003). ITV usage and revenue prospects range from video-on-demand (VOD), personal video recorders (PVRs), television commerce (t-commerce, i.e., interactive teleshopping via TV), to interactive advertisements on TV (Adams et al. 2002). Among them, VOD and PVRs have been touted as 'killer applications,' which are very attractive to consumers and drive the medium (or device) of those applications into millions of homes (Carey 1997; Lin 1999; NCTA 2002; Pastore 2000).

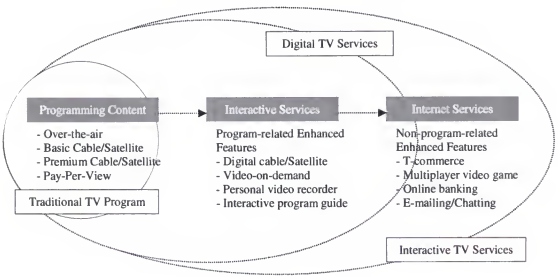

Figure 1-1. Convergence of programming, interactive, and internet services in ITV. Adapted from Stevenson I., Nichols E., Harman N., Trotter P., and Kee R. (2002). Ovum forecasts: Global IP and broadband markets. Retrieved on March 2002 from http://www.ovum.com/go/content/017323.htm.

In my study, an ITV prototype is referred to as a device or system that provides full-scale (or high-end) interactive content or applications, which reflect a convergence of three types of services: (a) traditional television programming content, (b) interactive service (i.e., digital television service), and (c) Internet service. Figure 1-1 on the previous page summarizes the three types of ITV-associated services.

As shown in Figure 1-1, an ITV prototype incorporates the following programs or services: (a) traditional programs that offer access to additional information about specific programs or advertising viewers are watching, (b) interactive services that enable consumers or media users to access or record movies anytime, to play along with game shows, and so on (e.g., video-on-demand, personal video recorders), and (c) Internet services that allow viewers to shop for, or purchase, an item (e.g., t-commerce), search television listings for hundreds of channels, obtain up-to-the-minute news and weather through two-way communications (via the Web or other medium), play games with neighbors while chatting, and participate in opinion polls, etc.

The ITV prototype is distinct from VOD or PVRs in that although the ITV includes both VOD and PVRs, it is one particular model of organizing non-program-related features (e.g., online banking, chatting) within the traditional TV context (Kim and Sawhney 2002). The ITV prototype is a *prospective* device or system that provides full-scale interactive services; hence, it is at present unavailable at the low-end set-top boxes for VOD and PVR services. The high-end ITV prototype is expected to emerge in the U.S. market in the near future (NCTA 2003).

The full two-way interactive applications can be offered by any type of TV operator (e.g., cable, satellite, and terrestrial broadcast), but a return path is required,

whether it is via cable, wireless or dial-up. The scope of the interactive applications or content may be an ideal reference tool for interactive service providers, off-the-air television broadcasters, direct broadcast satellite operators, cable service providers, and advertisers.

In fact, prospects for consumers' adoption of such interactive applications are still unknown. As initial market trials (e.g., GTE and Time-Warner's test services) with full-scale (or high-end) interactive television features suggested, enhanced interactive services had an uncertain growth potential at that time (Lin and Jeffres 1998). However, currently developed interactive services may have a good prospect in the market as a result of a variety of converged types of media, especially the Internet, which now have stimulated consumer demand for high interactivity.[1]

As a matter of fact, playing game/downloading on TV was perceived as the most popular among interactive functions on ITV (Adams et al. 2002). According to a report (JMR 2002b), WorldGate, a leading provider of interactive entertainment solutions for the cable industry, achieved success promoting games with MPEG (Moving Pictures Experts Group) graphics as an ITV service. This success indicates the existence of consumer demand for high interactive applications beyond VOD movies or PVRs.

Purpose of the Study

The fast growth of high-speed Internet access and digital satellite services has intensified competition for viewer adoption of media and communication products and

[1] Interactivity is defined here as a media experience offered by technologies in which media users can participate in modifying the form or content of the mediated environment and simultaneously in facilitating each other's communication needs (Ha and James 1998; Steuer 1992). The greater number of form and content that can be manipulated at consumer discretion and that can satisfy consumer needs for communication, the greater the range of interactivity of a medium. For instance, consumers can modify content while playing multiplayer games on TV and further exchange instant messages with neighbors on TV. These activities have higher interactivity than has turning the TV on or off. The detail regarding the interactivity will be discussed in the next chapter (see p. 15).

services. In this competitive environment, consumers' real demand can be a gateway for success in the market. Interactive television (ITV) has actually gained appeal because of its essential characteristic (interactivity). In addition, because of its interactivity, enhanced ITV features are expected to build viewer loyalty, attract new subscribers, and increase retention for cable operators. Thus, thoroughly understanding consumer demand for ITV is imperative for cable operators who seek to refine the effectiveness of their own present or future ITV service prior to its widespread implementation.

My study, thus, explores the predictors that affect potential consumer (or media user) intent to adopt an ITV prototype and reveals consumers' real demand for ITV. To achieve this purpose, the study focuses on consumer motives, as well as several predictors (e.g., personal characteristics, media perceptions), within the context of other competing media and communication services. More specifically, my study examines consumer motives for ITV and the association of those motives with intent to adopt a prospective ITV. Furthermore, the study uses an innovation-adoption model to investigate how personal characteristics, together with other predictors (e.g., perceived functional substitution), affect the intent to use ITV. In summary, my study answers the key questions:

- What are consumers' or media users' motives to adopt or use an interactive television prototype?
- What are consumer preferences for interactive television (ITV) applications or services? Which ITV applications are most sought by consumers?
- Is an interactive television (ITV) prototype perceived as a substitute for competing media or as a supplement for them? And how is perceived functional substitution related to intent to adopt ITV?

- Which factors differentiate potential subjects on intent to adopt an interactive television prototype?
- Which current and planned interactive television (ITV) applications can provide the greatest opportunity for an increase of ITV subscribers? And how should cable operators and ITV content providers position themselves for a successful rollout of newer ITV applications?

My study is organized as follows. In the second chapter, the relevant literature on the theoretical background used in my study is reviewed. Based on the literature review, a conceptual model is proposed as the framework of an innovation-adoption process, and then research questions and hypotheses are developed in the third chapter. Next, the method for investigating the research questions and testing the hypotheses is articulated in the fourth chapter. The fifth chapter presents the results of several statistical analyses with the collected data, and the last chapter provides discussions as well as practical and theoretical implications of my study.

CHAPTER 2
LITERATURE REVIEW

This chapter reviews existing research and theories associated with interactive television (ITV) that were applied to my study. First, the history of ITV, from the 1970s to the present, is summarized. Based on the historical background, this chapter presents three ITV service models that are categorized by two dimensions of interactivity. In addition, this chapter explicates the reasons why ITV is considered an innovation. Literature reviews then provide several factors that affect consumers' innovation adoption in a general context, as well as some adoption process models. In addition, my study proposes new approaches to modeling an innovation-adoption process for ITV. Lastly, the study offers primary theories that help rationalize research questions and hypotheses.

Past, Present, and Future: A History of Interactive Television

There has been a controversy surrounding the issue of when interactive television (ITV) began. Some argue that ITV started almost five decades ago (Adams et al. 2002).[2] Others argue that ITV started in the 1970s when ITV emerged as a two-way interactive system in the market (Freed 2003; Swedlow 2003). My study discusses the history of ITV since the 1970s, focusing on ITV as a device or system.

[2] The first ITV program was "Winky Dink and You," which aired from 1953 to 1957 (Adams et al. 2002).

1970s to 1980s

There have been many market trials and tests for interactive television (ITV) since the 1970s. In the U.S., a notable, large commercial test of interactive cable television was Amex's Qube system in Columbus, Ohio. The results of the test are difficult to summarize, but it is clear that consumers resisted dramatic changes to their media consumption patterns. One of the reasons for the resistance was caused by several technological problems in ITV, e.g., poor equipment and undeveloped interactive programming (Carey 1997; Offutt 1982). Qube was doomed to failure in the late 1970s.

During the 1980s, there was a movement toward simpler services, such as interactive text on TV, interactive games over cable, and opinion polling through 900 number telephone services. In the early 1980s, Cox Cable rolled out a videotex service via two-way cable, i.e., Indax (Carey 1997). During this same period of time, Time Inc. developed Time Teletex, which was a teletext service using an entire cable channel. In both cases, the technology cost was very high, and the marketplace reactions to them were lukewarm (McCarthy 1985). While such commercial trials were made in the industry, interactive services also were tested in education fields. These educational services allowed for full two-way video between teachers and students who were at a distance (Carey 1997). One of these services was instructional television, which is one-way video instruction by satellite, cable or microwave frequency with return audio via a telephone call (Jääskeläinen 2001). Such services provided thousands of students with courses that would otherwise be unavailable in rural areas.

In Western Europe, there were a lot of ITV trials and tests during the 1980s. Several videotex services (e.g., Telidon in Canada, Minitel in France, and Prestel in the UK) were tested as initial ITV systems (Jääskeläinen 2001). The videotex services

started in the late 1970s and continued through the 1980s, using fiber optic cable to provide videophone calls, interactive text services, better TV reception, and extra cable channels for movies (Gerin and Tavernost 1987).

1990 to 1995

In the first half of the 1990s, cable and telephone companies conducted a number of ITV trials. For instance, Time Warner offered a high-end ITV service with shopping, news, and games, as well as video-on-demand (VOD), in its Full Service Network trial in Orlando. The trial by itself was successful, but Time Warner pulled back from its ambitious ITV service and cancelled plans to roll out the service in other areas, primarily owing to cost and technological problems (Maney 1996).

AT&T and Bell Atlantics deployed ITV trials with their employees to obtain experience in operating ITV networks and to get feedback about the attractiveness of those services. AT&T reported strong concerns about interactive educational programs for children, sports and games (Keller 1993). Bell Atlantics gained positive results form a large consumer test of VOD services. Consumers were willing to shift money within their household entertainment budget from video rentals to VOD. GTE, however, discovered through its market trial that VOD was very attractive, but consumers were not willing to pay more than one dollar for VOD over what they paid to rent a movie at a rental store (Bulkeley 1994).

1996 to Present

While the trials from cable and telephone companies were taking place, the Internet was growing rapidly. In the mid-1990s, television-related browser plug-ins and video applications were released to the market (Swedlow 2003). For instance, PCTV, InternetTV, NetTV, etc. claimed to be the video solution that enabled computers to view

video, audio, and data downloaded from the Internet. At this time, cable and telephone companies chose a new strategy, i.e., evolutionary development, as a more realistic move to overcome costs and technological limitations associated with ITV (Carey 1997). Thus, both cable and telephone companies began to develop simpler services with less costly technology and to upgrade the necessary infrastructure (Chan-Olmsted and Kang 2003). Cable operators decided to offer interactive services through cable modems and to evolve to interactive video over time. Telephone firms also decided to introduce digital-subscriber-line (DSL) or asymmetric DSL (ADSL) as a first step toward their interactive television services via the Internet access.

In the very late 1990s, the ITV industry finally began to take shape when Microsoft's WebTV and AOLTV emerged (Swedlow 2003). In 1996, WebTV introduced its standalone set-top box and positioned itself as an important leader in the ITV industry. WebTV used the television screen to display Web sites via the set-top box, reaching one million subscribers in 2000 (Swedlow 2003). AOLTV was WebTV's most important competitor. AOLTV launched a comparable Internet-TV-converged service by the end of 1999 (Thielmann and Dowling 1999). Most recently, AOL Time Warner has created a new Interactive Video division to accelerate the growth of ITV through advanced cable services, including VOD, subscription VOD (SVOD), cable IP (Internet protocol) telephony, and other advanced services (AOL 2003).

Future

In the new millennium, most ITV-associated companies (cable, telephone, satellite, content providers, etc.) have exploited existing telecommunication infrastructure (such as cable modem or ADSL) to support VOD and other enhanced features (Freed 2003). They, however, withdrew their rollout of high-end ITV services and moved to more cost-

effective packaged services, principally offering VOD and interactive program guides (IPGs) (Pastore 2001, Jan; Aug). Although the U.S. economy appears to be slowing down, most researchers stressed that the growth potential for ITV in the U.S. would be tremendous (Jupiter Media Metrix 2001). As established infrastructure and content are upgraded over time, the companies associated with the ITV industry are expected to deploy higher-end ITV services.

Interactive Television in a Multichannel Video Programming Market

An interactive television prototype (ITV)[3] is expected to compete with other media in the multichannel video programming (MVP) market. The MVP market includes cable television, direct broadcast satellite, off-the-air broadcast television, the Internet, home video sales and rentals, etc. (FCC 2003).

Cable subscription occupies 76.5% of the MVP market (FCC 2003). The number of cable subscribers reached almost 68.8 million as of June 2002, and among them, more than 16.8 million households subscribed to digital cable in the United States (FCC 2003). In other words, around 40 percent of total cable subscribers are estimated to be now digital cable subscribers. In addition, most major cable operators are testing or offering video-on-demand (VOD) services. For example, Comcast claimed that it has launched VOD in 15 markets, covering over 3.2 million subscribers (NCTA 2002), and AOL Time Warner also has started VOD services in at least eight of its markets, with 3.3 million subscribers (Kagan World Media 2002).

[3] In my study, an interactive television prototype is defined as a device or system that provides full-scale (or high-end) interactive content or applications, which reflect a convergence of television, computers, the Internet, telephony, and videocassette recorders.

Direct broadcast satellite (DBS) subscribership has grown significantly to about18 million households, and now represents 20.3% of all multichannel video programming subscribers (FCC 2003). As of June 2002, an estimated 54 million households are served by an Internet access service (FCC 2003). Real time and downloadable video continue to become more widely available over the Internet, and the amount of content also is increasing. That is evidence of increasing interest in Internet video deployment. Thus, it can be inferred that the Internet is seen as a direct competitor to ITV, as well as to traditional video services, such as off-the-air broadcast, DBS, and cable television.

Home video rentals and sales, including videocassettes, digital video discs (DVDs), and laser discs, are considered part of the video marketplace because they provide services similar to premium, pay-per-view, and VOD offerings. As of June 2002, about 90% of all U.S. households have at least one VCR, and the number of homes with DVD players grew rapidly to 14 million by the end of 2001 (FCC 2003). High-definition (HD) television covers less than 2% of the 106 million households with television sets in the U.S. (Lowery 2003). Personal video recorders (such as TiVo) on the other hand, are used by less than 1%, i.e., approximately one million homes (FCC 2003).

Currently, in terms of competition, the ITV market exists in the areas in which multichannel video programming distributors or content providers overlap. In 2001, the number of ITV users was approximately 1.7 million (Adams et al. 2002). That number is expected to reach 39.5 million by 2005, making ITV one of the strong competitors in the MVP market (Adams et al. 2002).

At this point, it is necessary to identify which ITV service now exists and will be available in the near future. In addition, it is necessary to categorize those ITV services

into some practical service models. This will lead to an in-depth examination of the most effective packaging of existing and future ITV services. Prior to discussing ITV service models, several definitions of interactivity and its dimensions are reviewed here. Through this review, my study attempts to develop a criterion for the categorization of ITV service models.

Interactivity

Numerous definitions of interactivity have been offered (Kim and Sawhney 2002). At the most basic level, most definitions of interactivity refer to the fact that viewers provide some inputs into media content. In the process, viewers or media users gain some degree of control over the content of programming. However, the reference to interactivity in interactive television (ITV) is beyond the simple issue of media user input in (or control over) the message received. My study summarizes several conceptual definitions of interactivity, to identify exactly what is meant by interactivity in ITV services.

Conceptual Definitions

There exist many conceptual definitions of interactivity. Steuer (1992) referred to interactivity as the degree to which media users can modify the form and content of a message in a mediated environment. Hoffman and Novak (1996) suggested that interactivity is a nonlinear search and retrieval process and enables users a great sense of control. Rafaeli (1998) defined interactivity as the extent to which sequential messages relate to each other, and especially the extent to which later messages react to the relatedness of earlier messages. Ha and James (1998) viewed interactivity as another aspect of the communication exchange paradigm, defining interactivity as the extent to which the communicator and the audience facilitate each other's communication needs.

After reviewing the aforementioned studies, my study found that interactivity is generally defined with two main concepts: (a) modification and (b) communication (or interrelationship). As a result, interactivity is defined here as a technological media experience in which media users can participate in modifying the form or content of the mediated environment and facilitate each other's communication needs (Ha and James 1998; Steuer 1992). The former emphasizes modification in the media environment (Hoffman and Novak 1996; Steuer 1992). The latter focuses on communication in relation to communicators and message exchanges (Ha and James 1998; Rafaeli 1998; Williams et al. 1988). The two main concepts are similar to a previous study's two approaches to understanding interactivity within the context of new media, i.e., (a) media environment and (b) communication approaches (Kim and Sawhney 2002).

Dimensions of Interactivity

Both whether a medium (or its use) is interactive and to what degree of interactivity exists in a medium are addressed by describing the different aspects (i.e., dimensions) of interactivity. For instance, the level of interactivity in new media has been estimated with a variety of dimensions : (a) speed, range, and mapping (Steuer 1992), (b) responsiveness to the user, amount of effort users must exert, complexity of user choice, facilitation of interpersonal communication, ease of adding information, and degree of controlling information use (Heeter 2000), and (c) more (but complex) choice, new chances for altering the message, the capability of time-shifting for certain media experiences, and chances to interact with others (Williams et al 1994).

The concept of interactivity can also be divided into three dimensions: Human-human, human-machine, and human-message transactions. Cho and Leckenby (1999) suggested that there are two 'dominant' dimensions to define interactivity, i.e., human-

human and human-message transactions. The human-machine transaction dimension does not sufficiently describe interactivity (Cook 1994). Regarding human-human transactions, interactivity is viewed as the extent to which an individual actively participates in an information-exchange process with other individuals (Cho and Leckenby 1999). In the human-message transactions, interactivity is referred to as the extent to which users can participate in modifying the form and content of a message (Steuer 1992).

ITV is in a nascent phase of development, generating many rapidly evolving products and services. Given this fact, assessing the level of interactivity in ITV services seems to be implausible with the aforementioned dimensions. Drawing from previous studies (Adams et al. 2002; Cho and Leckenby 1999; Ghose and Dou 1998; Heeter 2000; Steuer 1992), my study explores which dimensions of interactivity can be applicable to ITV services.

Interactive Television Service Models

Based on Adams et al's (2002) three service models, my study attempts to apply two dimensions (i.e., transaction and time) of interactivity to ITV services. In other words, ITV services are categorized according to the levels of transaction and time (see Figure 2-1 on the next page).

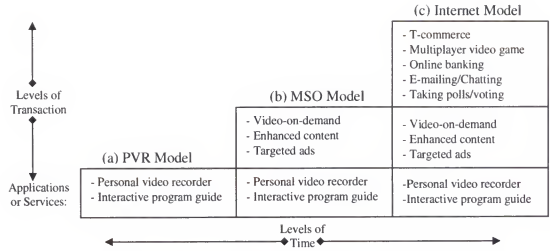

Figure 2-1. Three service models for ITV. Adapted from Adams, M., Anand, P., and Fox, S. (2002). Interactive television. Retrieved on December 15, 2002, from http://www7.kellogg.nwu.edu/student/class/techventure/wireless/MISC%20PAPERS/Interactive%20Television%20Chapter-7.doc

The degree of interactivity in ITV services is assessed using the transaction dimension. More specifically, transaction has two parts: (a) the extent to which some form of interpersonal two-way communication exists between viewer and content provider (or distributor) and (b) the extent to which the viewer can control and modify the content and format (e.g., story plots, camera angles). The more human-human and human-message transactions in a specific ITV service model, the higher level of interactivity for that model (Cho and Leckenby 1999). For instance, the Internet model has higher interactivity than the PVR and the MSO models, because the Internet model provides more opportunities for transactions among viewers and messages/other viewers, e.g., surfing the Web, playing real-time multiplayer games, and chatting with others.

The degree of interactivity in ITV services also is estimated using the time dimension, namely whether interactivity is simulated, delayed or real-time (see Figure 2-1). In other words, the more the *immediate* transaction in an ITV service model, the higher the interactivity for that model.

Simulated interactivity is implemented locally at consumers' homes without any return path. An example of simulated interactivity is an electronic program guide. Personal video recorders (PVRs) use telephone lines to update program schedules automatically every day. In this sense, PVRs lie between simulated and delayed interactivity. As examples of delayed interactivity, video-on-demand, enhanced program content, and interactive targeted advertisements (e.g., catalogue shipping after exposure) are offered via upstream paths from set-top boxes. Finally, in terms of real-time interactivity, a high speed two-way connection between end-users and cable operators/programmers allow for greater manipulation of content. T-commerce (television commerce, i.e., interactive teleshopping on TV), online banking, e-mailing/chatting, taking polls/voting, and multiplayer video games are among services offered via real-time interactivity.

The Personal Video Recorder (PVR) Model

The PVR model is based on the assumption that media users do not like (a) to communicate with other viewers via TV and (b) to modify formats and content of TV programs. Rather, media users hope to have more control over what they watch. The PVR services allow users to digitally record video content; to pause, rewind, and impose slow motion on live television; to record favorite shows easily; to skip commercials; and to find programs easily via an interactive program guide (Adams et al. 2002).

The Multiple Service Operators (MSO) Model

In the MSO model, the capability to modify information on a media user's television screen is feasible using digital set-top boxes from cable or satellite operators. In addition, this model incorporates viewers' individual preferences, making it possible

for viewers to view enhanced content and advertisements, to receive targeted advertisements, and to watch video on demand.

The Internet Model

In the Internet model, applications or content are offered via the Internet. This model encompasses the PVR and MSO model capabilities, while adding other functions, such as the capabilities to surf the Web, play real-time multiplayer games, and chat with other viewers. Yahoo! FinanceVision is an example of the Internet model. It enables media users to watch anchors read tech-stock stories, explore links to information applicable to the stories, monitor a personal portfolio, get stories for the stocks in the portfolio, trade stocks, and search the Web all on one screen (Adams et al. 2002).

My study anticipates that technological advances will accelerate the speed with which various media services (e.g., PVRs, VOD, and Internet access) converge in the near future. For this reason, ITV is expected to move toward higher levels of interactivity that can be incorporated via the Internet model.

Lack of Academic Research

The importance of interactive television (ITV) as a new medium and its enormous growth potential in a multichannel video programming market have stimulated industrial concerns about its adoption and use. Most trade magazines and journals have described scenarios and made predictions about the future of ITV. Although these opinions are not necessarily based on scientific research, they shed some insightful points of view.

First, people should not expect too much too soon. The benefit of ITV is still more a manufacturer's wish than customers' real demand (Freed 2003). Second, the direction of the industry is headed toward ITV, thus creating a paradigm shift in broadcasting. Television, sooner or later, will move into a time-free accessible medium

that is "browsable and no longer dependent on the time or day, or the time required for delivery" (Jääskeläinen 2001, p. 25). Last but not least, researchers should consider the importance of two-way communication among people, which will ultimately become feasible via ITV (Jääskeläinen 2001). This notion emphasizes the possibility of ITV's distinctive role in communications, as also seen in the Internet.

Regardless of the above-mentioned industrial concerns and interests, there is little previous research on ITV, not to mention an ITV prototype and its definition (Kim and Sawhney 2002; Carey 1997). Thus, the variations among different ITVs make it difficult for my study to define an ITV prototype. As mentioned in the former chapter, my study defines the prototypical ITV as a device or system that provides full-scale (or high-end) interactive services or applications. Based on this new definition, my study attempts to seek some theoretical perspectives for an examination of prototypical ITV usage. Prior to those theoretical approaches, my study first investigates ITV's innovativeness by clarifying why ITV is viewed as an innovative medium.

Interactive Television as an Innovation

An innovation is "an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (Rogers 1995, p. 11) and "a product which is perceived by the consumer as new" (Ram 1987, p. 208). Consumers may consider interactive television (ITV) an innovation due to its interactive characteristics. More specifically, ITV's advanced features, especially high interactivity, may lead consumers to perceive an ITV prototype as an innovation in media and communication fields.

Categories of Innovation

Innovations, in general, have an impact on consumer behavior[4], e.g., consumption patterns, such as new product adoption (Ram 1987). However, not all innovations have the same level of newness. The degree to which an innovation affects consumption patterns depends on characteristics of the innovation. Robertson (1971) posited three types of innovations: (a) continuous, (b) dynamically continuous, and (c) discontinuous innovations. A continuous innovation is introduced as a modified product, and hence the innovation requires little disruption in consumers' consumption patterns. A dynamically continuous innovation demands some disruption in the consumption patterns but does not alter them substantially. A discontinuous innovation is a new product that necessitates learning a dedicated user skill. It may force consumers to alter their existing consumption patterns dramatically or to establish new consumption patterns (Robertson 1971).

ITV as a Discontinuous Innovation

Applying Robertson's (1971) framework to a specific product category (i.e., home entertainment), Krugman (1985) presented a model that delineated a continuum of new telecommunication technology offerings and consumption, based on the potential impact on subscribers' viewing behaviors. The model categorizes over-the-air television as standard, basic cable as continuous, pay cable as dynamically continuous, and interactive services (e.g., VCRs, home computers, computer games, online shopping) as discontinuous consumption media.

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[4] Consumer behavior is referred to as "the mental and emotional processes and the physical activities that people engage in when they select, purchase, use, and dispose of products or services to satisfy particular needs and desires" (Bearden et al. 2003, p. 75)

According to the model, consumers feel that television is acceptable in its existing form. Basic cable enables viewers to have more entertainment value via specialized viewing, so it falls into the continuous category (Krugman 1985). Pay cable viewers are more prone to use television as an important alternative to movies (i.e., theatre-going) or movies rentals. In that sense, pay cable belongs to the dynamically continuous innovation category. Computers, VCRs, and digital cable services all fall into the discontinuous innovation category since their two-way interactivity is considered as the most fundamental criterion in differentiating discontinuous innovations from dynamically continuous ones (Kang 2001; Krugman 1985).

The model is somewhat arbitrary in drawing distinct lines among the innovation categories, but "there is enough evidence to acknowledge that variation does indeed exist" (Krugman 1985, p. 24). ITV services (i.e., video-on-demand, personal video recorders, and enhanced television features) can be classified as a discontinuous innovation, based on Krugman's model. ITV's interactive attributes might differentiate ITV from current media, in terms of consumer adoption. Finally, those attributes might make significant changes to their established media consumption patterns, e.g., ITV's substitution for those media.

Factors Affecting Innovation Adoption

Several factors are involved in the decision to adopt an innovation. Reagan (2002) classified levels of these factors. According to his classification scheme, the factors at an individual level reflect cost, relative advantages, demographics, communication needs, interests, attitudes, media use (i.e., media repertoires and media usage level), and so on. At a technical level, there exist complexity and available bandwidth. In addition, the factors at a societal/corporate level include social norms,

overall economic situation, capital investments, and marketing strategy. My study lays emphasis on variables at the individual level, while summarizing all three levels of factors that can potentially influence the adoption of an interactive television prototype.

Individual Level

Cost and relative advantages: Cost is almost always the primary factor in the adoption of an innovation (Reagan 2002). The cost of an innovation is closely associated with the consumer's perceived resources (e.g., affordability). For example, early adoption of an innovation is normally costly and unaffordable to average consumers or media users. According to Beckman's (1996) study, media users perceive the cost of interactive television (ITV) as the most important factor that will affect the rate of ITV adoption. Nonetheless, media users may be willing to pay their money for an innovation due to its perceived benefits. The perceived benefits (or relative advantages) of the innovation can determine whether or not consumers use it (Rogers 1995).

Demographics: Many researchers found demographics (or socioeconomics) were critical in the adoption of an innovation (James et al. 1995; Neuendorf et al. 1998; O'Keefe and Sulenowski 1995). Age, income, and education have been viewed as predictors of the following innovative technologies: Videotex systems (Eastlick 1993; Ettema 1984), cable television (Atkin 1993; LaRose and Atkin 1988a; 1988b), call-in polls (Atkin and LaRose 1994), computers (Lin 1998), the Internet (Atkin et al. 1998; Cheong 2002; Kaye and Johnson 2002; Korgaonkar and Wolin 1999; Zhu and He 2002), audiotext (LaRose and Atkin 1992; Neuendorf et al. 1998), pagers (Leung and Wei 1999), high-definition television (Dupagne 1999), and digital cable (Kang 2002a; 2002b; 2001; Jeffres and Atkin 1996). For instance, Kang (2002a) found that consumers' decisions to adopt services vary according to market segments. High-income consumers

are more likely to adopt digital cable service than are low-income ones. Those demographics and social indicators, however, are not consistent in terms of their role in predicting innovation use, and their explanatory influence has weakened over time (Neuendorf et al. 1998).

Communication needs: Some studies have considered communication needs as a predictor of new media adoption. For example, Rafaeli and LaRose (1993) discovered that communication needs are the most important predictors of bulletin board success. Jeffres and Atkin (1996) also investigated communication needs with two major communication variables: (a) the need to send messages to large audiences via mass media and (b) the need to engage in interpersonal communication over computer/telephone or some other technology. They found that communication needs are positively related to an interest (or likelihood) in expanding the passive roles of viewers to their active roles, such as sending messages using new technologies (Jeffres and Atkin 1996). Neuendorf et al. (1998) found that communication needs (i.e., frequency of communication interaction at work, home, etc.) are more important than social indicators (e.g., income, education).

Interests and attitudes: An individual's interests play a role in innovation adoption. For example, those who have low interest in sports are less tolerant of complex technologies for sports information access (Reagan 1996). Dupagne (1999) found that an individual's interest in high-definition (HD) television affected his or her HD television adoption and that interest was predicted by television attributes (e.g., picture sharpness, sound quality, and screen size). On the other hand, LaRose and Atkin (1991) contended that an individual's attitudes toward functionally similar existing media influenced

exposure to innovative media. For instance, attitudes toward competing movie distribution modes predicted pay-per-view consumption behavior (LaRose and Atkin 1991).

Media use: Media use is an important indicator of how innovations will be adopted (Reagan 2002). Media use consists of two different concepts: (a) media repertoire (i.e., media ownership) and (b) media usage level (i.e., the amount of time in television viewing, radio listening, newspaper reading, moviegoing, etc.). Individuals use a repertoire of media (i.e., different sets of media) that serve different functions (Reagan et al. 1995). If an innovation fits into an existing functional set, the innovation is more likely to be adopted (Neuendorf et al. 1998). Media usage level, on the other hand, has been frequently addressed as an important factor in several studies (see Table 2-1, p.44-51). The interesting fact is that the results were inconsistent. For instance, Collins et al. (1983) found that television viewing was negatively related to cable subscribership, while Reagan (1987) found the opposite evidence, namely that television viewing was positively related to cable subscribership.

Technical Factors

Complexity: Rogers (1995) identified five perceived attributes of innovations, i.e., relative advantage, compatibility, complexity, trialability, and observability. He contended that the perceived complexity of an innovation is negatively related to its rate of adoption, while the perceived relative advantage, compatibility, trialability and observability of an innovation are positively associated with its rate of adoption (Rogers 1995). In a study of computers, Lin (1998) also found that perceived complexity negatively influenced the willingness to adopt the innovation.

Available bandwidth: To adopt telecommunication innovations, a certain portion of bandwidth is required. Zysman (1995) pointed out that a lack of bandwidth, i.e., incapacity to provide a required broad bandwidth, impedes the market growth for telecommunication innovations. For instance, a consumer's decision to adopt digital cable or high-speed Internet service might be influenced by whether the consumer resides within the coverage of the existing broadband infrastructure. Tedesco (1998) also argued that the biggest obstacle in adopting innovations was the connection to the home.

Societal/Corporate Level

Social norms: Societal factors play a part in whether an innovation can be introduced to society. Rogers (1995) suggested that social norms affect how quickly an innovation was accepted and then popularized. For instance, the 900 dial-a-porn service may have slowed the development of audiotext because people had negative perceptions about the service. In other words, due to those negative social norms, the dial-a-porn service was legally challenged and disappeared from the market (Reagan 2002).

Economic situation: Overall economic situation plays a significant role in consumers' adoption of innovations. The economic situation might directly influence consumers' disposable income, which was an important resource to adopt an innovation (Rennie 1995). In addition, the overall economy affects investment levels in firms that are developing or marketing innovations. If the economy was in a downturn, available capital for innovations might be reduced, leading to slow growth of innovation adoptions (Martin 1977).

Capital investments: Innovations are dependent on capital investments (Agarwal and Goodstadt 1997). For example, some cable operators (such as Comcast and Cox Communications) were testing cable telephony, i.e., an innovation similar to

voice-over-the-Internet (Rosenbush et al. 2003). The service converts telephone calls into digital bits of data, sends them over the Internet in packets, and reassembles them into analog sounds at the other end of the line. Most big cable operators actually decided to wait on telephony until they had upgraded their cable systems with digital technology. Now, the Internet cable telephony has the potential to be successful in the market because the capital cost has fallen to around $600 per household, less than half what it was in the 1990s (Rosenbush et al. 2003). As in this case, adoption of an innovative service can be subject to the speed or amount of capital investment.

Marketing strategy: Once an innovation is introduced in the market, the rate of its adoption growth is determined primarily by marketing strategies. According to Agarwal and Goodstadt (1997), several marketing strategies are important: (a) branding (i.e., making people more familiar or better aware of an innovation), (b) customer relationships, (c) niche marketing, and (d) horizontal integration (i.e., integrating the innovation with other complementary technologies). Those kinds of strategies may strongly influence the adoption of an innovation.

These factors (cost, relative advantage, communication needs, compatibility or familiarity, media use, interests, attitudes toward an innovation, etc.) can interact with each other to influence consumers' adoption decisions. For instance, low cost may be insufficient to lure consumers if they are unfamiliar with the innovation or perceive it to be complex. Interrelationships among the variables might make it difficult to understand the exact consumer demand for ITV. Hence, it is necessary to select relevant variables carefully and then to examine their interrelationships simultaneously in a model.

Meta-Analysis of the Innovation Adoption Literature

To isolate relevant or potential factors influencing the adoption of an interactive television (ITV), my study reviewed the findings of previous research concerning adoption of media (videotex, cable, videocassette recorders, the Internet, etc.) and provided a summary and synthesis of the findings of 35 research studies on innovation adoption (see Table 2-1, p. 44-51). The findings of existing studies were reported in the table; each study is in a column, and adoption predictors are in a row.

My study selected adoption research recently published in major communication journals (Journalism and Mass Communication Quarterly, Journal of Broadcasting and Electronic Media, Journal of Communication, Communication Research, Journal of Media Economics, Telematics and Informatics, and so on).

The topics were limited to media innovations that would compete with an ITV prototype (i.e., videotex, cable, videocassette recorders, computers, pagers, audiotext, and telephony). Qualitative studies that did not use statistical sampling methods were excluded. My study, however, included most of those early studies in new media adoption, which were based on convenient, non-random sampling, due to the exploratory nature of those studies.

Meta analysis is a comprehensive attempt to assess the general findings across studies. It was useful for two reasons. First, meta-analysis enabled my study to identify which factors are related to innovation (or new media) adoption. Generally, meta analysis is a useful tool for researchers: (a) "to determine which factors have contributed to systematic differences across studies" and (b) "to identify areas that have been neglected and warrant further investigation" (Abernethy and Franke 1996. p. 2-3). Thus,

this attempt could be helpful in finding some common factors across new media and further screening unsuitable factors for this ITV study.

Most research on innovation adoption investigated individual-level factors, especially consumers' perceptions about new media (see Table 2-1, p. 44-51). In those studies, consumers' perceptions about technical attributes of a new medium had significant impacts on the adoption of the new medium. More specifically, consumers' perceptions about relative advantages, motivations, and expectations were found to primarily affect the adoption of several media. In addition, media use (i.e., media usage levels and media repertoires) and demographics (income, education, family size, age, etc.) were related to consumer adoption across media, even though those factors generated inconsistent results from different studies. Thus, consumers' perceptions, media use, and demographic factors were primarily considered for my study. Few studies, on the other hand, have found technical/social/corporate factors to be significant predictors of new media adoption, and those predictors tend to be valid for specific media (see Table 2-1, p. 44-51). For instance, off-air-reception, the number of program services (LaRose and Atkin 1988b), and attitude toward the innovativeness of cable firms (Kang 2002a) were addressed exclusively in cable adoption, while connectivity was addressed in the computer adoption (Perse and Dunn 1998). Therefore, those factors were not considered for my study, but a factor (i.e., computer connectivity) could be included here as one of the technical difficulties that consumers might face in using ITV.

Second, meta-analysis enabled my study to develop an appropriate model for ITV adoption based on studies on various types of new media. ITV is a converged format of various media, such as television, computers, the Internet, telephony, and videocassette

recorders. Thus, from various studies on those media, the current ITV study obtained valuable insights about how to develop a research model that best fits ITV adoption. For instance, Internet and telephone adoption studies dealt with personal traits, such as communication orientation (Atkin et al 1998) and sociability (Dimmick et al. 1994; O'Keefe and Sulanowski 1995). Digital cable and videocassette recorder adoption studies focused on the relationships among other media use, namely, media assessment (Jeffres and Atkin 1996) and compatibility (Henke and Donohue 1989). Thus, these factors could be assessed jointly within the research model of my study.

In addition to these studies on factors affecting innovation adoption, there have been several attempts to develop a general model of the innovation adoption process. These models aided the development of the research model of my study.

Innovation Adoption Process Models

The innovation adoption process models specify the sequence of consumers' mental and behavioral events in adopting an innovation (Robertson 1971). Generally, an innovation adoption process starts with the perception of a problem (or innovation itself) that causes an individual to engage in information seeking, resulting in awareness of the innovation and subsequent knowledge about it, and then a favorable attitude toward the innovation occurs, followed by adoption or trial (Mason 1962).

Ram (1987) proposed an adoption process model using innovation resistance. According to the proposed model, if consumers perceive an extremely high degree of change in using an innovation, then they would resist it. If the innovation faces consumers' resistance, then firms need to modify the innovation to reduce the resistance. The modification would be made depending on what motivates consumers to resist. For instance, if the resistance is caused by a high degree of complexity, the modification

attempts to reduce the complexity. During the process of modification, consumers postpone or delay accepting the innovation. If the innovation cannot be revised, then it would be rejected, or otherwise adopted.

Burt and Kinnucan (1990) discovered different types of models for adopters of information systems. These models include the user view (i.e., an expert or novice), the mental view (i.e., mental process differs according to whether one is an expert or novice), and the task view (i.e., a task is approached differently by each individual). Stanek and Mokhtarian (1998) presented a model for home-based telecommuting that involves drives, attitudes, and information about the innovation. These factors were presumed to affect the consumers' evaluation about the innovation, and the evaluation, in turn, leaded to their preferences and, ultimately, to their adoption.

Rogers (1995) developed an early adopter model, which consists of five stages in the innovation-adoption decision process: (a) knowledge, (b) persuasion, (c) decision, (d) implementation, and (e) confirmation. The first stage (i.e., knowledge) occurs when a consumer is exposed to an innovation's existence, and the consumer learns how it functions. Persuasion takes place when a consumer shapes a favorable or unfavorable attitude toward the innovation. Decision occurs when a consumer adopts or rejects the innovation, implementation takes place when a consumer really uses the innovation on a regular basis, and confirmation occurs "when a consumer seeks reinforcement of the innovation-adoption decision already made, or reverses a previous decision to adopt or reject the innovation if exposed to conflicting messages about the innovation" (Rogers 1995, p. 162).

Eastlick (1996) examined a model of the innovation adoption process with regard to interactive teleshopping via television. The model showed that consumers' opinions of the innovation attributes of interactive teleshopping (relative advantage, ease of use, etc.), their personal characteristics relative to innovativeness (e.g., shopping innovativeness), and their previous acquisition patterns (e.g., shopping orientation, attitude toward other shopping methods) affected their attitudes toward interactive teleshopping. Those attitudes, in turn, influenced intent to adopt interactive teleshopping. Applying this model, Eastlick (1996) identified the profiles of innovators, early adopters, followers, and non-adopters of interactive teleshopping.

Dutton et al. (1987) built a conceptual framework for addressing adoption, use, and social impacts of personal computer adoption, as shown in Figure 2-2 on the next page. The framework identified four major categories of variables: (a) the independent variables predicting adoption, (b) the intervening variables of adoption, (c) patterns of use, and (d) potential impacts, conceptualized as dependent variables. Social status, other media use, technical/personal attributes, and social/corporate factors were expected to affect the new medium adoption, its use patterns, social surroundings, etc. These potential impacts, in turn, were expected to have a direct or indirect feedback effect on the each of the antecedent variables. To build a research model, my study attempts to use Dutton et al's (1987) model as a basis, while applying it to a context of ITV adoption. More specifically, my study focuses on predictors of adoption and adoption, as depicted in the dotted-line box (see Figure 2-2).

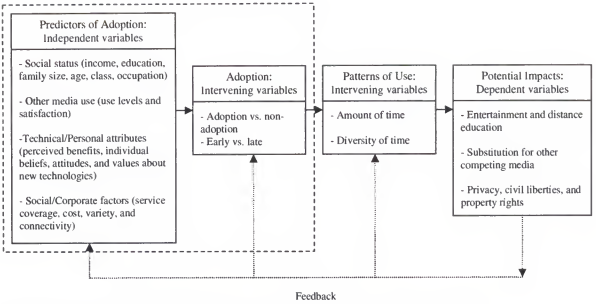
Predictors of Adoption: Independent variables
- Social status (income, education, family size, age, class, occupation)
- Other media use (use levels and satisfaction)
-Technical/Personal attributes (perceived benefits, individual beliefs, attitudes, and values about new technologies)
- Social/Corporate factors (service coverage, cost, variety, and connectivity)
Adoption: Intervening variables
- Adoption vs. non-adoption
- Early vs. late
Patterns of Use: Intervening variables
- Amount of time
- Diversity of time
Potential Impacts: Dependent variables
- Entertainment and distance education
- Substitution for other competing media
- Privacy, civil liberties, and property rights
Feedback

Figure 2-2. Factors affecting adoption, use, and social impacts of personal computing. Adapted from Dutton, W. H., Rogers, E. M., & Jun, S. (1987). Diffusion and social impact of personal computers. Communication Research, 14(2), 219-250.

Those aforementioned studies (i.e., studies on both factors affecting innovation adoption and innovation adoption process models) were useful in initiating analyses of ITV adoption. In the next phase of developing a research model, my study attempts to have new approaches to ITV adoption, as distinct from those previous studies.

Three Distinct Approaches

Modeling Approach

My study explores a new innovation model for an interactive television prototype (ITV) and further empirically tests the model. One might think that positive motives, images, and better social systems (e.g., available media services) would likely lead to the success of a new medium. However, the positive relations alone are sometimes insufficient to predict new media adoption. When such adoption factors do present themselves and the innovation fails in the market, one must search for the real reasons of failure through a modeling process (Reagan 2002).

As a matter of fact, most research on new media adoption has already developed the conceptual frameworks for media adoption (Dutton et al. 1987), and analyses of a simple relationship between adoption behavior and some factors without any specific path among them (Eastlick 1996). However, these studies could not reveal the exact causal link among various factors. In this sense, a modeling approach is necessary, to understand the intricacies that those factors might cast on ITV adoption.

Consumer-Perception-Focused Approach

My study focuses on consumers, especially their perceptions (including needs or interests) about an interactive television prototype (ITV). In fact, there has been little academic research with regard to consumers' perceptions about ITV. Beckman (1996) interviewed cable managers associated with ITV services for their perceptions about ITV and its adoption rate. Jääskeläinen (2001) developed a set of strategic questions in the development of ITV by investigating a thinking process for programmers. Those previous studies did not examine consumers' perceptions about ITV.

The intensity of market competition among comparable products and services necessitates an investigation of consumers' perceptions of and demand for ITV. Thus, the consumer-perception-focused approach to ITV can help to identify implicit or unarticulated demand that may have great significance for the future of ITV (Krugman 1985).

Contextual Approach

My study considers consumers' adoption patterns in a contemporary multimedia environment. This contextual approach results in the comprehensive examination of a new, converged medium, i.e., interactive television (ITV).

Many media studies still have focused on single innovations. Dimmick et al. (1994) and O'Keefe and Sulanowski (1995) studied telephone use. Price (1997) investigated electronic commerce with an innovation model, and Stanek and Mokhtarian (1998) analyzed telecommuting. Lin (1998) explored personal computer adoption, and Papacharissi and Rubin (2000) examined audience uses of the Internet. Dupagne (1999) assessed consumer predispositions toward high-definition television and profiled potential adopters of this new technology. Kang (2002a) investigated the determinants of digital cable service adoption. However, it does little good to figure out what factors predict the adoption of a single medium "if those same factors cannot also help to predict convergence and emerging services that provide similar services" (Reagan 2002, p. 83). Hence, my study adopts a *comprehensive* approach to the converged innovation of ITV in the context of other media (Ferguson and Perse 2000; Flanagin and Metzger 2001; LaRose and Atkin 1992; Lin 1999; Neuendorf et al. 1998; Perse and Courtright 1993; Rice 1993).

Theoretical Backgrounds

Little is known about the factors that could determine the fate of an interactive television prototype (ITV) and how important any such factors are to consumers. Few studies have comprehensively approached consumers' demand for ITV, especially in light of the multitude of media choices in today's complex media environment. My study incorporates the following theoretical backgrounds to explore consumers' or media users' actual demand for ITV.

Expectancy-Value Perspective

Several perspectives have attempted to characterize the nature of media interaction, the patterns of use, and the process through which viewers are aware of

messages. Among them is uses and gratification perspective. The uses and gratification perspective has the following assumptions: (a) media selection is initiated by the individual, (b) expectations for media use are produced from individual predispositions, and (c) active audiences have goal-directed media behavior (Ruggiero 2000). As a variety of media emerges, audience members become active in choosing a medium. This audience activity not only depicts the audience as selective but also covers a range of possible orientations to the communication process. This notion states that different individuals tend to display different types and amounts of activity in different communication settings and at different times in the communication process. In this sense, the uses and gratification perspective affords some insights into how a *new* medium differ from the *old*, in terms of audience motives toward the medium, as well as why audience use (or adopt) the medium.

Expectancy-value perspective primarily concerns motives for media use, factors that influence the motives, and outcomes from media related behavior (Eastlick 1996; Lin 1998; Stanek and Mokhtarian 1998). In this sense, that perspective has been treated as a valuable theoretical approach for uses and gratifications research on new media adoption (Leung and Wei 1999; Raybun II 1996).

According to the expectancy-value perspective, media consumption is guided by perceptions of the probability and evaluations of the potential consequences (Ajzen and Fishbein 1980). In other words, behavior or behavioral intentions and attitudes are determined by value expectancies or beliefs. In the context of an innovation adoption, the greater the relative values or advantages expected by the innovation, the greater the incentive to adopt it.

Diffusion of Innovations

A theoretical convergence of diffusion of innovations and uses and gratifications perspective research may be a fruitful avenue for further new media research (Flanagin and Metzger 2001). This implies that uses of communication technologies should be usually examined with the various motives for (or expectations about) those technologies at each stage of diffusion process.

Diffusion of innovations has long been a general theory of how new ideas or technologies are adopted or rejected. Rogers (1995) and his colleagues contend that the diffusion of innovations is a process through which ideas are communicated through various channels, over time, among individuals in a social system. The theory has a focus on communication channels, stages of awareness and decision making, criteria for decisions, and characteristics of potential adopters, while the uses and gratifications theory centers mainly on what needs may be fulfilled by media uses.

According to Rogers' model, an innovation process is referred to as the process through which an individual passes from knowledge of an innovation, to attitude formation (i.e., persuasion), to decision to adopt or reject, to implementation of new media, and to confirmation of this decision. The Rogers' model addresses all stages associated with the adoption of an innovation. Specifically, the first three stages (i.e., knowledge, persuasion, and decision) are usually designated as the adoption decision process. The process incorporates the effects of personality type, experiences, awareness, knowledge, and attitudes on the adoption decision.

The adoption decision process in diffusion of innovations is very useful in explaining how to adopt a new medium that does not yet exist in the marketplace

(Eastlick 1996). In this sense, the process provides a theoretical framework that enables the explanation of how potential media users go through new media adoption process.

Functional Similarity Principle

Some studies have addressed the adoption issue in the context of a complex media environment (Perse and Courtright 1993; Rice 1993). Functional similarity principle is a useful perspective in explaining new media adoption within a complex media environment (Cai 2001). The rapidly changing, convergent media environment can make this principle more valuable than ever. This principle posits that if a new medium is perceived as being able to satisfy the same needs fulfilled by the old media more effectively, it will, to some extent, substitute the old.

When a new medium functionally similar to other media is introduced in the market, the new medium is perceived as a supplement to (or substitute for) the existing media. For example, a new medium can be perceived as a supplement to similar existing technologies, as in the cases of cable television and online services (Lin 1999; 2001). Cable television is perceived as a supplement for functionally similar media, such as VCRs and camcorders (Atkin 1992; Jeffres and Atkin 1996; Lin 1999). In contrast, there is support for media substitution among entertainment technologies. The multimedia cable service, which provides several hundred voice, data, and video channels via a coaxial cable television systems, can be used to substitute for current cable and off-the-air television services (Lin and Jeffres 1998).

Most research on new media has dealt with post hoc explanations for the functional similarity mechanism, i.e., the effects of a new medium adoption on existing media (Cai 2001; Jame et al. 1995; Kaplan 1978; Lazarsfeld 1940; Robinson 1981; Weiss 1969). After a new medium is introduced, people tend to reorganize time allocation

patterns of existing media and spend less time watching or using those media. The decline in time spent using traditional media is considered one of the outcomes of new media adoption.

However, a few studies on new media diffusion have answered the question of whether functional similarity is related to predictors of new media adoption. LaRose and Atkin (1991) explored the functional similarity of media and suggested that the attitudes toward functionally similar media alternatives positively influence media exposure. They found that among competing movie distribution modalities, attitudes toward movie-theater attendance would predict pay-per-view consumption (LaRose and Atkin 1991). Some studies supported the premise that people with lower levels of viewing and lower satisfaction with television content were more likely to adopt multimedia cable services; this finding helps verify the concept of functional similarity (Atkin 1993; LaRose and Atkin 1992; Lin and Jeffres 1998).

As mentioned earlier, the functional similarity principle raises two conflicting arguments, i.e., functional supplement versus substitution. The functional substitution concept can be more valid in explaining ITV adoption than is the functional supplement, because ITV offers their interactive enhanced TV functions. Those functions of ITV are new, discontinuous, and different from one-way television viewing. In this sense, consumers can choose ITV instead of the current television set. As in the case of multimedia cable services (Lin and Jeffres 1998), ITV can be substitutable for other competing media due to the interactive enhanced functions in ITV. For this reason, the functional substitution is used here to test the functional similarity principle within the context of competing media. If a new medium is perceived as a substitute for competing

old media and the perception will encourage media users to adopt the new medium instead of those old media, that principle can be verified empirically.

Social Environment Perspectives

Media users' needs or beliefs are not always strictly personal but may be influenced by social environments. In other words, consumer behavior is shaped and controlled by both internal dispositions and social environments (Bandura, 1994). There are two perspectives regarding social environment factors that may not be individuals' control.

Uses and dependency perspective: Uses and gratifications (U&G) research focuses on the gratification of individual needs and motives for new media (Rubin and Rubin 1985). U&G research, thus, has been criticized for being too individualistic in terms of conceptualization. Some argued that by treating media as an intra-individual process, U&G perspective makes it difficult to generalize findings beyond individuals (Elliott 1974). This criticism can be addressed by a uses and dependency perspective that integrates the individual-oriented premises of U&G into the social system framework of the dependency model (Ball-Rokeach and DeFleur 1976; Rubin and Rubin 1985).

The uses and dependency (U&D) perspective assumes that (a) available choices in media and media content alter motives for media use, (b) the media uses and effects process is affected by audience-media-society interactions, and (c) dependency on a certain medium is associated with availability of functional alternatives (Rubin and Rubin 1985). In other words, U&D studies assume that availability of media infrastructure and/or media repertoire affects the innovation decision process (Korgaonkar and Moschis 1987; Rubin and Rubin 1985).

According to the U&D perspective, the potential for media use is dependent on how many resources media users possess (e.g., affordability for media use). In addition, the more opportunities consumers have to seek information about media, the more frequently they use or adopt alternative media, and hence, consumers naturally reduce their dependency on any particular medium (Rubin and Rubin 1985). Media choice is also influenced by availability of technical systems. For instance, consumers who live within the coverage area of a particular broadband infrastructure might not rely exclusively on a specific medium (e.g., newspaper or cable television) and thus they are more likely to adopt a new medium.

Theory of planned behavior: Media users' beliefs in their *self-efficacy* to exert control over environments influences what action they choose to pursue (Bandura 1994). As similar to the concept of self-efficacy, the theory of planned behavior (TPB) introduced *perceived behavioral control*, which is useful to explain how social environments affect consumer behavior (Ajzen, 1991). That concept is referred to as "the perceived ease or difficulty of performing the behavior and is assumed to reflect past experience as well as anticipated impediments and obstacles" (Doll and Ajzen 1992, p. 755).

According to the TPB, when the behavior affords people complete control over behavioral performance, intention alone should be sufficient to predict behavior (Ajzen 1991; Ajzen and Fishbein 1980). However, when people believe that they have little control over performing the behavior due to a lack of requisite resources, then their behavioral intentions may be low although they have favorable attitudes concerning performance of the behavior. In other words, if a behavior is not under complete

volitional control, perceived behavioral control offers important implications that must add to the ability of the model to predict the behavior (Madden et al. 1992).

The two social environment perspectives are ones of many theories or paradigms that disentangle the complexity of new media technologies. Integrating these perspectives with others (e.g., uses and gratifications perspective, functional similarity principle, and diffusion of innovations) enables researchers to have a more accurate picture of new media adoption (Williams et al. 1994). The integrated effort helps explore the strengths and weaknesses of each perspective (Lin and Jeffres 1998). With these expectations in mind, the study proposes an adoption decision model for an interactive television prototype (ITV) in the next chapter.

In summary, there are several factors that influence the adoption of an innovation. Using these factors, many models have attempted to explain innovation adoption. This ITV study addresses the four theoretical perspectives. The first three perspectives (i.e., expectancy-value perspective, functional similarity principle, and innovation of diffusions) are concerned with consumers' perceptions or motivations, while the last (i.e., social environment perspectives) are with regard to the interaction between their perceptual variables and social environments. Based on these underlying perspectives, my study proposes an innovation-adoption process model. The following chapter illustrates the proposed model as a research framework and presents research questions and hypotheses.

Table 2-1. Innovation adoption literature

Innovation		Videotex			Cable Television		
	Author(s)	Etteman	Ledingham	Eastlick	Rothe et al.	Sparkers & Kang	LaRose & Atkin
Variables	Year	(1984)	(1984)	(1991)	(1983)	(1986)	(1988a)
Demographics	Income					+	+
	Education					-	ns
	Family size					+	+
	Age	ns[a]					ns
Other Media Use	Television						nr[b]
	Others	Newspaper (ns)	Video games (ns), computer/ ATM (+)		Newspaper (ns), magazine (ns), radio (+)		Movie rental (+)
	Satisfaction	nr				ns	cable service (+)
Personal Perceptions		Information importance (+)	Relative advantage (convenience, save time) (+), disadvantage (impersonality, no need, complexity) (-)	Relative advantage/ compatibility (+), personal values (ns), performance risk (-), triability (ns)	Relative advantage (more movies, more channels, variety, no ads) (+), interest (+), awareness (+)	Relative advantage (familiarity, compatibility, and attitude) (+)	Expectation met (+), complaint (-), service quality (ns), programming (ns), prior experience (ns), cable connection (+)
Technical/Social /Corporate Factors							Off-air-reception (-), county size (-), cost of cable service (ns), the number of programming service (ns)
Methods	Data Collection	Mail survey	Telephone interview	Mail survey	Mail survey	Telephone interview	Telephone interview
	Sample	101 (np[c])	406	578 (catalog shoppers)	674 (np)	117-300 Panel study	1,286 (cable subscribers)
	Response Rate	71-74%	nr	26.7%	33%	60-75%	60%
	Data Analysis			Stepwise logit regression	Frequency, percentage		Stepwise multiple regression

[a] ns means non-significant.
[b] nr means non-reported.
[c] np means non-probability sample.

Table 2-1. Continued

Innovation		Cable Television				
	Author(s)	Lin & Jeffres	Dupagne	Li	Kang	Kang
Variables	Year	(1998)	(1999)	(2001)	(2002a)	(2002b)
Demographics	Income	+	ns	+	ns	
	Education	+	ns	+	ns	ns
	Family size				ns	
	Age		ns	-	ns	-
Other Media Use	Television	-	ns	ns	+	
	Others	Newspaper (+), radio (+), movie attendance (ns), television (-)	Radio (ns), newspaper (ns), movie going (ns), documentaries viewing (ns), sports viewing (+)	Newspaper (+), magazine (+), movie going (+), Internet use (+)	Radio (ns), newspaper (ns), movie going (ns)	
	Satisfaction	Television (-), cable (-)			+	
Personal Perceptions		Innovativeness traits (+)	Technology ownership (ns), television attributes (screen size (+), picture sharpness (ns), sound quality (ns)	Relative advantage (+), technology ownership (+), Relative disadvantage (-)	Premium subscribership (+), attitude toward self (+), media ownership (ns)	Perceived IPG utility (+), perceived IPG complexity (-), motivations (ns), premium subscribership (+)
Technical/Social /Corporate Factors					Attitude toward the innovativeness of cable firm (+)	
Methods	Data Collection	Telephone survey	Telephone survey	Telephone survey	Telephone survey	Telephone survey
	Sample	301	193	1012	333	369
	Response Rate	nr	47%	56%	56%	60.3%
	Data Analysis	Multiple regression	Correlation, logistic/linear hierarchical regression	One-way ANOVA, multiple regression	Discriminant, hierarchical multiple regression	Hierarchical multiple regression

Table 2-1. Continued

Innovation		Cable Television					
	Author(s)	LaRose & Atkin	LaRose & Atkin	Atkin	Atkin	Lin	Jeffres & Atkin
Variables	Year	(1988b)	(1991)	(1992)	(1993)	(1994)	(1996)
Demographics	Income	ns	ns		+	+	-
	Education	ns	ns		nr	ns	-
	Family size	ns	nr	nr	ns	-	
	Age	-	-	nr	ns	-	
Other Media Use	Television	+					+
	Others	Newspaper (+), movie attendance (+), movie rental (ns), VCR ownership (+)			VCR (+), Video game (ns), PC ownership (+), videotex (ns)		Radio (+), newspaper (-), movie attendance (+), magazine (ns), cable (+)
	Satisfaction	Broadcast television (ns)				TV viewing (+)	Media assessment (+)
Personal Perceptions		Expectation met (ns), complaint (ns), service quality (+), programming (ns), prior experience (ns)	Pay-per-view attitude (+), movie theater attitude (-), pay TV (ns), commercial TV attitude (-), VCR attitude (ns)	Satisfaction with pay TV, movies, overall cable service, and customer service (+)	Technology ownership (+)	Viewing exposure (+), pre-viewing planning (+), during-viewing switching (+), post-viewing (+)	Communication needs (+), relationship with technology (+)
Technical/Social /Corporate Factors		Off-air-reception (-), county size (-), cost of cable service (ns)					
Methods	Data Collection	Telephone survey	Telephone survey	Mail survey	Classroom survey	Telephone survey	Telephone survey
	Sample	1,235 (cable subscribers)	450 (cable subscribers)	918 (cable subscribers)	224 (college students)	516	302
	Response Rate	60%	nr	31%	nr	74%	nr
	Data Analysis	Discriminant analysis	Multiple regression	Descriptive univariate	Descriptive univariate	Mean comparison	Multiple regression

Table 2-1. Continued

Innovation		videocassette Recorder			Computer Bulletin Board	
Variables	Author(s) Year	Levy (1980)	Levy (1987)	Henke & Donohue (1989)	Garramone et al. (1986)	James et al. (1995)
Demographics	Income					+
	Education					+
	Family size					
	Age					ns
Other Media Use	Television					-
	Others			Movie going (-)		Magazine (-), radio (ns)
	Satisfaction					
Personal Perceptions		Use frequency, selected parts of day	Audience activity	Intended functions of VCR [network miniseries, X-rated programming, hours per week of VCR use, extra pay-cable, sporting events, regular network programs] (sig., 71%), taping motivations (+)	Motivations [surveillance (+), personal identity (+), diversion (+)], satisfaction with bulletin board system (+)	Other communication activities, electronic billboard usage pattern
Technical/Social /Corporate Factors						
Methods	Data Collection	Mail survey (diary)	Mail survey	Telephone survey	Telephone survey	Online survey
	Sample	249	143	485	117	173
	Response Rate	nr	51%	nr	90.8%	62-70.4%
	Data Analysis	Frequency, percentage	Frequency, percentage	Discriminant, canonical correlation	Factor analysis, frequency, correlation	Frequency, percentage

Table 2-1. Continued

Innovation		Computer/Internet					
	Author(s)	Danko & MacLachlan	Perse & Dunn	Atkin et al.	Lin	Parthasarathy & Bhattacherjee	Korgaonkar & Wolin
Variables	Year	(1983)	(1998)	(1998)	(1998)	(1998)	(1999)
Demographics	Income	ns		+	+		+
	Education	+		+	ns		+
	Family size			ns	ns		
	Age	-		-	-		ns
Other Media Use	Television	-	-	-	-		
	Others	Video games ownership (+), VCR (ns)	Video rental (+), cable (-), PPV (ns), newspaper (ns), radio (ns)	Movie going (+), video rental (+), cable (ns), radio (ns), magazine (ns), newspaper (ns)	Radio (ns), newspaper (ns), magazine (ns)		
	Satisfaction						
Personal Perceptions		Computer control (-), entertainment at home (-)	CD ownership (+), gratification sought (+)	Communication needs (ns), communication activities & orientations (-), technology relationship (+)	Advantages (+), resources (-), needs for innovativeness (+), complexity (ns), technology ownership (+)	External influence (+), interpersonal influence (-), utilization (+), usefulness (+), easy of use (ns), compatibility (+), network externality (+)	Social escapism (+), information, interactive control (+), socialization (+), economic motivations (+), privacy concerns (ns)
Technical/Social /Corporate Factors			Computer connectivity (+)				
Methods	Data Collection	In-home interview	Telephone survey	Telephone survey	Telephone survey	Mail survey	Telephone survey
	Sample	1,669	1,071	377	561	145	401
	Response Rate	nr	11%	nr	62%	32%	nr
	Data Analysis	Stepwise discriminant analysis	Chi-square, post-hoc Duncan's test, correlation	Factor analysis, ANOVA, ANCOVA	Factor analysis, ANOVA, regression	Multiple discriminant analysis, MANOVA	Multivariate discriminant analysis

Table 2-1. Continued

Innovation		Computer/Internet					
	Author(s)	Lin	Ferguson & Perse	Stempell III et al.	Lin	Flamagin & Metzger	Kaye & Johnson
Variables	Year	(1999)	(2000)	(2000)	(2001)	(2001)	(2002)
Demographics	Income	nr		+	+		ns
	Education	nr		+	+		-
	Family size	nr			-		
	Age	nr		ns	-		ns
Other Media Use	Television	-		ns	ns		
	Others			Newspaper (+), radio news (+), magazine (ns)	Newspaper (-), magazine (+), radio (ns)		
	Satisfaction						
Personal Perceptions		Online access motivations (+) (i.e., surveillance, escape, companionship, personal identity, and entertainment), TV-use motivations (ns) (i.e., surveillance, escape, and personal identity)	Entertainment (+), pass time (+), relaxation (+), social influence (+), expertise or prior experience (+)	Information seeking (+)	Motivations [entertainment (+), informational learning (+), escape/interaction (+)], adopter attributes [adopt ion benefits (+), complexity (+), innovativeness need (ns), available resources (ns)], adoption cluster (+)	Functional similarity, motivations	Guidance (+), information/surv eillance (+), entertainment (ns), social utility (+)
Technical/Corpo rate Factors							
Methods	Data Collection	Telephone survey	Online survey, media use diary	Telephone survey	Telephone survey	In-class Survey	Online survey
	Sample	348	236	805	421	684	308
	Response Rate	60%	nr	nr	62%	nr	nr
	Data Analysis	Multiple regression, MDS (Multidimensional scale)	Factor analysis, correlation, multiple regression	Chi-square	Factor analysis, hierarchical multiple regression	Cluster, MANOVA	Factor analysis, correlation, regression

Table 2-1. Continued

Innovation		Computer/Internet		Pager	Audiotext	
	Author(s)	Zhu & He	Cheong	Leung & Wei	LaRose & Atkin	Neuendorf et al.
Variables	Year	(2002)	(2002)	(1999)	(1992)	(1998)
Demographics	Income	+	+	ns	-	ns
	Education	+	+		+	ns
	Family size	ns	ns			ns
	Age	-	-	-	-	ns
Other Media Use	Television		ns	ns		ns
	Others		Newspaper (ns), radio (ns), magazine (ns)	Television news (ns), newspaper (ns)	Telephone credit card (+), computer modems (ns), personal computer (-), facsimile (ns), pager (+), touch tone telephone (-), auto-teller machine (+)	Premium cable (ns), movie going (+), magazine (ns)
	Satisfaction		Assessment on media credibility (ns)			
Personal Perceptions		Relative advantages (ns), compatibility (+), ease of Internet use (+), image of Internet use (ns), result demonstrability (+)	Family function (-), perceived effectiveness (+), perceived negative impact (ns), perceived novelty (ns)	Expectancy values [seeking information (+), instrumentality (+), novelty (ns), seeking fun (ns), credibility (ns)	VCR ownership (-)	Quality of life (-), personal communication (+)
Technical/Social /Corporate Factors						
Methods	Data Collection	Telephone survey	Telephone survey	In-class survey	Telephone survey	Telephone survey
	Sample	1,007	868	883	551	331
	Response Rate	38%	48.8%	67.6%	45%	nr
	Data Analysis	Multinomial logistic regression, General linear model	T-test, hierarchical regression, zero-order correlation	Factor analysis, multiple regression, correlation	Multiple regression	Multiple regression

Table 2-1. Continued

Innovation		Telephone		Personal Video Recorders
	Author(s)	Dimmick et al.	O'Keefe & Sulanowski	Ferguson & Perse
Variables	Year	(1994)	(1995)	(2001)
Demographics	Income		-	
	Education		ns	
	Family size		ns	
	Age		-	
Other Media Use	Television			
	Others			VCR (+)
	Satisfaction			TV viewing (+)
Personal Perceptions		Sociability, instrumentality, and reassurance factors	Sociability (+), entertainment (+), acquisition (ns), time-management (+)	Enjoyment (+), learning (+), pastime (+), relaxation (+), entertainment (+), arousal (+)
Technical/Social /Corporate Factors				
Methods	Data Collection	Telephone survey	Telephone survey	Online survey
	Sample	525	597	121
	Response Rate	nr	52%	nr
	Data Analysis	Factor analysis	Factor analysis, regression	Correlation

CHAPTER 3
RESEARCH MODEL

This chapter discusses the research model for my study. Based on the model, research questions and hypotheses are presented in this chapter.

An Innovation-Adoption Model

My study adapts models used in previous studies (Atkin and LaRose 1994; Dutton et al. 1987; Eastlick 1993; 1996; Garramone et al. 1986; Jeffres and Atkin 1996; LaRose and Atkin 1992; Reagan 1987; 2002; Robertson 1971; Rogers 1995) and proposes a decision model for the adoption of an interactive television (ITV) prototype. The proposed model is labeled an innovation-adoption model (see Figure 3-1).

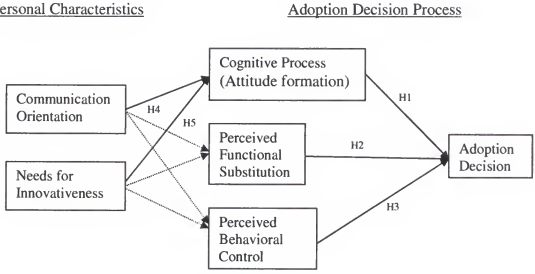

Figure 3-1. A research model: An innovation-adoption model

The model for ITV includes: (a) the adoption decision process and (b) the personal characteristics as antecedents of the adoption decision process. For my study,

ITV adoption is assumed to be an expensive and high-involvement purchase that requires an extensive decision making process (Greenleaf and Lehmann 1995).

Personal characteristics are most influential with two stages, i.e., knowledge and attitude formation (Rogers 1995). For instance, some consumers or media users tend to find out what kind of information other users receive and how those users interpret that information before making their own decision to adopt or reject the innovation. That tendency to seek information as a personal characteristic has an impact on the initial formation of possible favorable beliefs, attitudes, values, and behaviors (Rogers 1995). In this sense, personal characteristics in the research model (i.e., communication orientation and needs for innovativeness) are antecedents that might affect the adoption decision process, especially cognitive processing (including attitude formation).

New media services (such as an ITV prototype) require a high level of cognitive learning (Gatignon and Robertson 1985) so that cognitive processing in this research model can include elements of awareness, knowledge, and attitude formation. My study attempts to hold the levels of respondents' awareness and knowledge about the prototypical ITV constant. The aim of this attempt is to create new respondent awareness and knowledge about future ITV (i.e., an ITV prototype)[5] services without any resultant bias from their established knowledge of ITV. For this purpose, all respondents in my study are provided with equal information about characteristics and functions of the ITV prototype.

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[5] The prototypical ITV is defined here as a prospective device or system that provides full-scale (or high-end) interactive content or applications, which reflect a convergence of television, computers, the Internet, telephony, and videocassette recorders. The prospective ITV is now unavailable using current set-top boxes for low-end interactive services (e.g., interactive program guide, video-on-demand, personal video recorders).

The research model also describes several hypothesized paths among the variables of interest (see Figure 3-1, p. 52). Solid lines indicate hypothesized paths based on sound theoretical backgrounds, while dotted lines indicate non-hypothesized but potential paths without solid theoretical backgrounds. For example, two variables in the personal characteristic category may directly affect perceived functional substitution and/or perceived behavioral control, in addition to attitude formation. These causal relationships are not hypothesized initially, but instead will be explored through the testing of alternative models (i.e., competing models) in Chapter Five.

It may be impossible to create a general model of innovation adoption across all new media, which would have high scientific reliability and validity. In other words, a consistent adoption process seems unlikely across all ranges of media (Robertson 1971). However, it is possible "to develop multiple models of innovation adoption, each useful in explaining and predicting a set of functionally similar innovation clusters" (Reagan 2002, p. 84). My study anticipates that the proposed model for ITV can predict consistent patterns of diffusion for a converged medium cluster (including ITV, cable telephony, video streaming on the Web, etc.). The remainder of this section deals with the research questions and hypotheses associated with the proposed model.

Research Questions and Hypotheses

My study first attempts to identify consumer motives for an interactive television (ITV) prototype. It is not known what motivates viewers to adopt ITV, especially in conjunction with other competing media.[6] According to Papacharissi and Rubin (2000), motives are referred to as general dispositions that influence people's actions to fulfill a

[6] These media range from television (e.g., cable television, direct broadcast satellite television), video game consoles, videocassette recorders, digital video disc players, to Internet services. These media are assumed here to be in competition with ITV because it is a converged format of all the aforementioned media.

need or want. The expectancy value (or beliefs derived from ITV attributes) are defined here as motives that are expected to be key components of adoption behavior in my study. Thus, the first research question addresses the motives for an ITV prototype in a contemporary media environment.

> **RQ1**: What are the motives for adopting an interactive television prototype, compared with other competing media?

Adoption Decision Process

As mentioned in the previous chapter, many studies have attempted to identify a decision process of innovation adoption in media and communication fields. In fact, there are no consistent findings regarding the factors influencing an innovation adoption process. Nonetheless, attitudes toward (or relative advantages of) an innovation have been discussed consistently as predictors of innovation adoption (See Table 2-1, p. 44-51). Thus, my study selects attitude formation as the first factor influencing the adoption decision process.

Attitude formation: Some studies have found that a viewer's adoption of a particular medium is attributable to attitudes toward the medium (Palmgreen and Rayburn II 1982; Rubin 1986). The attitudes play a crucial role in explaining the motives for media use (Eagly and Chaiken 1993). A useful approach in explaining the relationship between motives and attitudes toward media is the multiattribute model, which is one of the most influential models of commercial processing (Rayburn II 1996). The advantage of this approach is that it allows researchers to discover an individual's

own beliefs or attitudes toward a *specific* behavior, which provides insights into the basis for that person's actual behavior (Ajzen and Fishbein 1980).

According to the multiattribute model, the outcome belief product (i.e., the sum of the consumer's subjective estimate of the probability that the behavior actually possesses an attribute, while multiplied by his or her evaluative response toward each individual attribute) is equivalent to the attitude toward the behavior (Antonides and Raaij 1996). The attitude, in turn, positively affects the behavior or behavioral intentions (Ajzen and Fishbein 1980). Thus, in the context of an interactive television (ITV) prototype adoption decision, attitude toward ITV is hypothesized to have a positive relationship with the intent to adopt ITV.

H1: Users who have a more favorable attitude toward an interactive television (ITV) prototype have higher intent to adopt ITV.

Perceived functional substitution: Media functions are likely to be contextually defined over time (Kayany and Yelsma 2000). Currently, many U.S. households have technologically complex environments with multiple television sets, computers, videocassette recorders, radios, telephones, fax machines, digital video disc players, game consoles, and so on. In the context of competing media, consumers' perceptions or expectations about a new medium influenced their decisions to adopt the innovation (Lin 1998; Perse and Courtright 1993). My study emphasizes perceived functional substitution as a predictor of the adoption of a new medium. The concept is defined here as an individual's expected outcome that a new medium will replace old media, based on his or her own experience with existing media.

The functional substitution has been measured on a single-item scale as one of many possible outcomes of new media adoption (Cai 2001; Jame et al. 1995; Kaplan 1998; Lazarsfeld 1940; Robinson 1981; Weiss 1968). There are a few studies that have examined a multi-item scale for perceived functional substitution. It seems to be difficult to validate perceived functional substitution empirically (Lin 2001). My study considers the perceived functional substitution as a cause or predictor of new media adoption and attempts to develop a multi-item scale based on this consideration.

Perceived functional substitution, which may influence the adoption of future innovations, can be deduced from past media experiences with similar innovations (Jeffres and Atkin 1996; Kayany and Yelsma 2000; LaRose and Atkin 1991; Rogers 1995). According to Lin and Jeffres (1998), levels of media use and satisfaction were related to functional substitution. Light media users, along with less satisfied users, are more likely to seek a new medium that can satisfy functionally similar needs. However, media use and satisfaction levels do not necessarily reflect media users' perceptions of functional substitution. For instance, even light, less satisfied media users cannot be tempted to adopt a new medium, unless they are attracted by its new features (Reagan 1996; Reagan et al. 1995).

Therefore, media users' interests in the newly developed features of a certain medium might be necessary to stimulate the perceived functional substitution for a certain medium. Media users who have high interests in new medium or its content tend to substitute traditional media uses with the new medium (Lin and Jeffres 1998; Reagan 1996). Thus, it is logical to assume that the levels of media use and satisfaction, along

with media users' interests in functionally enhanced features of a new medium, can represent the perceived functional substitution.

An interactive television (ITV) prototype is deemed capable of offering more enhanced functions than existing multimedia technologies, such as electronic media content, online shopping, games, and so on. In this regard, ITV is likely to be perceived as a desirable functional substitute, rather than a supplement, for existing media services. Based on the functional similarity principle, the more media users perceive ITV as a functional substitution for existing media, the more likely they are to adopt ITV (Lin and Jeffres 1998).

> **H2**: Users who have a higher tendency to perceive that an interactive television (ITV) prototype is a substitute for other competing media have higher intent to adopt ITV.

Perceived behavioral control: A new medium requires a technical basis, namely, "possession of knowledge or skills without which actual behavioral enactment is difficult or impossible" (Fisher and Fisher 1992, p. 460). New medium adoption, therefore, is likely to depend on connection to end-users, knowledge about how to operate each medium, and so on (Li et al. 1999; Rubin and Rubin 1985). Financial resources are also a requirement in adopting a medium that is expensive for middle-class households in the United States (Beckman 1996). In my study, the indicators of perceived behavioral control are the availability of requisite resources (e.g., affordability) and opportunities (knowledge, skills, connectivity, etc.).

The uses and dependency perspective contends that adoption of media services is affected by consumer resources and social systems for a new media (Rubin and Rubin

1985). The theory of planned behavior also suggests that better control over consumer resources leads to positive use of alternative media (Ajzen 1991). Based on these two perspectives, perceived behavioral control over future ITV service adoption is hypothesized to have positive effects on the intent to adopt ITV. The intent can predict actual adoption only when consumers have complete control over the adoption of ITV services (Madden et al. 1992).

> **H3**: Users who perceive that they have higher control over an interactive television (ITV) prototype have higher intent to adopt ITV.

Personal Characteristics

According to Rogers (1995), three types of personal characteristics (i.e., demographics, media use, and personalities) have important impacts on adopting an innovation. Demographics and media use have been extensively studied in adoption research, while the personalities associated with innovativeness have been little studied (Rogers 1995). In fact, personality variables have not been a main theme in many innovation adoption studies (Li 2003). Nonetheless, the personalities (such as communication orientation and needs for innovativeness) were shown important predictors in a few studies, especially on cable and Internet adoption (Jeffres and Atkin 1996; Jeffres and Lin 1998; Lin 2001; 1998). Given that a prototypical interactive television (ITV) is a combination of television (e.g., cable service) and Internet services, those personalities are also expected to be important predictors of ITV adoption.

Communication orientation: Some media users tend to search for information about an innovation (Rogers 1995). As new media continue to grow and provide

abundant consumer information sources, personal style or orientation toward communicating with other users may begin to play a more critical role in the adoption of an innovation.

People tend to develop his or her attitude toward the medium to the extent that they communicate or interact with salient others (Eastlick 1996; Rice 1993; Rogers 1995; Sproles and Kendall 1986; Sproles and Sproles; 1990). A study found that this orientation toward communication positively influences the attitude toward a medium (Eastlick 1996; Rogers 1995). Thus, it is anticipated that communication orientation (opinion leadership, information seeking, etc.) will have a positive impact on the attitudes toward an interactive television prototype.

> **H4**: Users who have a higher desire to communicate with others have a more favorable attitude toward an interactive television prototype.

Needs for Innovativeness: According to Rogers (1995), innovativeness is defined as "the degree to which an individual is relatively earlier in adopting new ideas or products than others" (Rogers 1995, p. 252). The needs for innovativeness have been utilized as measures of personal characteristics in addressing new media adoption (Lin and Jeffres 1998). As a matter of fact, an individual who has a strong need for innovativeness shows the corresponding behavioral patterns (Lin and Jeffres 1998).

The needs for innovativeness are referred here to as individuals' tendencies to seek novelty and to be more receptive to new ideas and new technologies (Lin and Jeffres 1998). The needs for innovativeness can be indicated by both an individual's tendency to

keep up with the knowledge of innovative ideas or products and also by an individual's willingness to take the risk of adopting new technologies or media (Lin 1998; 2001).

These psychological styles have been found to help prompt online service adoption decisions (Lin 1998; 2001). Overall, personal characteristics are found to indirectly affect consumers' overt behaviors (Eastlick 1996). Thus, drawing from previous studies (Eastlick 1996; Rogers 1995), my study anticipates that the needs for innovativeness will be positively associated with the attitudes toward an interactive television prototype.

> **H5**: Users who have a higher desire to be innovative have a more favorable attitude toward an interactive television prototype.

Many studies have utilized various model approaches (Burt and Kinnucan 1990; Eastlick 1996; Stanek and Mokhtarian 1998), to explain the significance of certain factors that have relatively strong impacts on new media adoption. In accord with those previous studies, my study examines which factors most strongly affect the intent to adopt an interactive television (ITV) prototype.

As with other media adoptions (LaRose and Atkin 1991; 1988a; Lin 2001), my study anticipates that attitudes toward ITV have the strongest effect on the intent to adopt ITV. The study also predicts that consumers' perceptions about ITV will be one of the most critical factors in the decision to adopt ITV. For instance, perceived functional substitution is expected to have strong effects on consumers' decision to adopt ITV, as competing media (video-on-demand over the Internet, online video games, etc.) are introduced.

Demographic and socioeconomic variables have various degrees of importance in predicting the adoption of an innovation at different stages of diffusion (LaRose and Atkin 1988a; 1988b). At early stages of diffusion, those variables play important roles in predicting an adoption behavior or discriminating between non-innovators and innovators. The strength of those variables in predicting adoption tends to diminish as time passes. For instance, demographic differences between non-subscribers and subscribers disappear over time (Sparkes and Kang 1986).

A recent report argued that about 1% of all television households had been provided with interactive television (ITV) services (Adams et al. 2002). With these services being in the nascent phase, my study anticipates that demographic and socioeconomic variables will play significant roles in predicting the intent to adopt ITV.

RQ2: Which factors have relatively strong effects on the intent to adopt an interactive television prototype?

In summary, my study proposes an innovation-adoption model that includes relevant variables derived from previous research. Based on the proposed model, two research questions and five hypotheses are summarized (see Table 3-1).

Table 3-1. Research questions and hypotheses

Variable	Research question
Motives	RQ1: What are the motives for adopting an ITV prototype, compared with other competing media?
	RQ2: Which factors have relatively strong effects on the intent to adopt an ITV prototype?
	Hypothesis
Attitude formation	H1: Users who have a more favorable attitude toward an ITV prototype have higher intent to adopt ITV.
Perceived functional substitution	H2: Users who have a higher tendency to perceive an ITV prototype to be a substitute for other competing media have higher intent to adopt ITV.
Perceived behavioral	H3: Users who perceive that they have higher control over the future

control	adoption of an ITV prototype have higher intent to adopt ITV.
Communication orientation	H4: Users who have a higher desire to communicate with others have a more favorable attitude toward an ITV prototype.
Need for innovativeness	H5: Users who have a higher desire to be innovative have a more favorable attitude toward an ITV prototype.

The next chapter presents the method of my study and examines those research questions and hypotheses. The examination of these questions and hypotheses is constrained to an interactive television (ITV) prototype, not overall existing ITV services. For this reason, it is very crucial to determine how to collect data utilizing some reliable and valid research methods.

CHAPTER 4
RESEARCH METHODS

This chapter describes pretest procedures/results, data collection, and statistical methods used to test the research questions and hypotheses outlined in the previous chapter. Two pretests were conducted prior to the main survey. The main mail survey was administered nationwide in the United States, based on the outcomes of the pretests. In order to analyze the collected data, the study performed both a structural equation modeling and a logistic regression analysis.

Pretests

My study conducted two pretests prior to the main survey. The purpose of the first pretest was to develop a reliable multi-item scale for perceived functional substitution and to extract motives or outcome beliefs about ITV by using open-ended questionnaires. The second pretest was used as a readability test for the main questionnaire used in the mail survey.

1st Pretest

The first pretest was an in-class survey. The questionnaires were randomly distributed in a classroom, and 110 undergraduate students in telecommunication participated in the survey. The pretest yielded 97 valid responses, after removing 13 cases (i.e., outliers and missing data). The pretest survey utilized two questionnaire formats, each having randomly ordered items concerning the enhanced features of interactive television. This task was intended to eschew potential bias that might be incurred by the ordering of items.

The pretest questionnaire had two parts. The first part contained the questions for the development of the perceived functional substitution scale. To the best of my knowledge, there was little prior research regarding the scale, but Lin and Jeffres' (1998) scale with two items (i.e., media usage level and satisfaction with other media content). Although their trial was significantly valid, as Lin and Jeffres mentioned, it was necessary to continue to refine the functional substitution scale because it had only relatively moderate explanatory power (Lin and Jeffres 1998). Therefore, my study attempted to create a scale by adding levels of interests in enhanced interactive television (ITV) features to the two-item scale.

Multiple regression analysis revealed that the interests in enhanced ITV functions (β=.32, $p< .05$) and media usage level (β=-.27, $p< .05$) were the predictors of perceived functional substitution. However, levels of satisfaction with other media content were not significantly related to perceived functional substitution, as shown in Table 4-1.

Table 4 -1. Results of multiple regression with three indicators of perceived functional substitution

Predictors	Regression coefficient	Significance
Interest in ITV functions	.32**	.00
Media usage level	-.27**	.00
Satisfaction with other media	-.08	.42

** Significant at the .01 level.

From the pretest result, it could be inferred that adding the new variable "interest in ITV functions" was not good for a reliable three-item scale of perceived functional substitution. Rather, the interest carved out the variance accounted for by satisfaction with other media. The value of R-square decreased to .39, indicating that only 39 percent of the variance in perceived functional substitution was explained by the three indicators. However, the new variable was significantly somewhat strong (β=.32, $p< .05$) enough to be tested again in the main questionnaire. Thus, the study included the three indicators

(i.e., interest in ITV functions, media usage level, and satisfaction with other media) in the main questionnaire.

The study also tested the functional substitution scale by using straightforward wording on three items, as described below. The three different items asked respondents the levels of functional substitution for every other competing medium, such as existing television services (i.e., cable, satellite, territorial or antenna television services), the Internet, videocassette recorders, digital video disc players, and video game consoles.

- ITV services will be a substitute for other competing media.
- Other competing media will be replaced by ITV services.
- ITV will let you increase or decrease in time spent on other competing media.

These three items were separately measured for each of media, and summed to create a composite measure. The coefficient Cronbach's alpha was estimated as an indicator of inter-item reliability or consistency. The range of Cronbach's alpha was between .62 and .83. These values were above a low acceptance limit of .60 in exploratory research (Hair et al. 1998). There, on the other hand, might be a wording problem in the questionnaire, i.e., respondents can misunderstand easily the aforementioned three items as *general* perceptions, not individual *specific* perceptions. To address the problem, these items were modified in the main questionnaire. For instance, the phrase "from my perspective" was added to the question, "How much do you agree that other competing media will be replaced by ITV services?"

The second part of the first pretest was used for identifying motives (or outcome beliefs) in adopting an ITV prototype and for screening outcome beliefs about future ITV use. Researchers have recommended that salient beliefs be used as a more reliably

measure of attitudes toward a particular behavior (Budd 1986; Pligt and Vries 1998). Thus, my study extracted some salient motives (or outcome beliefs) by using belief-based items in an indirect measure, rather than a direct measure. The indirect measure requires relatively reasoned responses (e.g., individuals are motivated to purchase ITV because they can control their viewing, in terms of time and viewing options), while a direct measure evokes only an automatic reaction (e.g., individuals intend to purchase ITV because of their favorable attitudes toward ITV) (Ajzen 1991).

Ten or more outcome beliefs were frequently mentioned in the open-ended pretest. Eight of those salient beliefs were selected because they were mentioned five or more times, as shown in Table 4-2.

Table 4-2. Results of open-ended questions about outcome beliefs

Outcome belief	Frequency
Control or handle television programs in an easier way (e.g., pause, rewind, forward, stop, record television programs without tapes, rotate camera angles, and order any movie desired at any time)	52
Save time or more convenient (e.g., efficient enough to operate both internet access and television simultaneously, do multitasking by only using one system or easier to rent movies that are sold out, easier to pay for a lot of media uses with an integrated bill, online shopping while watching live television programs, fewer physical electronics such as DVD, VCRs, stereo, and video game consoles)	40
A variety of information about programming or more viewing options (e.g., more choices, more channels, more "hands-on," providing more in-depth information and searching for shows)	24
More shows that fit my tastes (e.g., offering personalized shows or programs, cater more to my demands of certain services than regular cable, radio, and VCRs)	20
Being more entertained (e.g., couch potato, better viewing experience, and making sports entertainment better)	8
Instantly communicate with others, unlike traditional television	5
No commercials (e.g., being free from television advertisements, taking away from advertisement that is a main and important source of information in our lives, and not being exposed to new things)	5
Privacy infringement (e.g., selling my preferences or identification information for commercial purposes, having a company knowing my tastes and interacting with you can cause it to be too much access to my personal interests)	5

2nd Pretest

The second pretest was administered to test if non-expert adults could easily understand the technical terminologies used in the main questionnaire. These technical terms in a main questionnaire might be difficult for the layman to understand. Twelve persons were solicited to participate in the pretest survey. They were 33 ~ 62 years old and their jobs ranged from housewife to manager. They took a readability test for the questionnaire. After the test, appropriate changes were made to consolidate the content, to increase clarity, to let respondents easily understand, and to facilitate good flow from one section to another.

Mail Survey

A large-scale national mail survey was conducted to address consumers' (or media users') psychological motives for an interactive television (ITV) prototype. The nationwide survey could help segment media users' patterns. Furthermore, the survey served as a barometer of media users' perceptions of various functions of an ITV prototype in the context of competing media, such as the Internet, cable television, online video games, and so on.

The population for this mail survey was Internet users. This population could have various experiences with multimedia uses and could have the ability to make comparisons among competing media. The intent of my study was not to generate a random sample of the entire U.S. population, but to attract experienced multimedia users who would be more likely to use an ITV prototype.

Sampling

My study purchased a mailing list of 1,500 Internet users from the mailing list brokerage firm, Experian.com. The source of the list was from BehaviorBank data,

which collected names through surveys distributed nationally through magazine inserts, co-ops, inserts in mail-order packages, direct response Web sites and email, as well as product registration cards found in durable goods packaging (Experian.com 2003).

The brokerage firm randomly drew a list of Internet users among census tracts/groups, basing selection on two criteria (i.e., gender and the number of households in each state). For instance, the ratio of men and women was the same as the gender ratio in the 2000 Census Data, and the number of online users drawn in a state was in proportion to the number of households in the state. Each of the sampled Internet users was offered a mail package that contained a cover letter, survey questionnaire, and business reply envelope.

To generalize the results of the study, it was very crucial for the sample to be representative of the study population. One of the ways to achieve generalizability was to raise the response rate to above the average response rate (Ha and Chan-Olmsted 2001). To stimulate a high return rate, my study utilized follow-up mailings during data collection. The study had two waves of mailings. The second mailing was conducted three weeks after the first mailing, which has been recommended as a reasonable space between mailings (Babbie 2001). In addition, the study offered a monetary incentive, namely a one dollar bill. In market research, this monetary incentive is a very common tactic to boost the response rate and gives respondents compensation for time and effort spent participating in the survey (Aaker 1997).

Comparisons with Other Survey Methods

Online survey vs. others: Online surveys have several advantages over traditional methods: (a) online surveys have low costs, (b) they are easy to conduct, (c) they require shorter development-to-implementation time, and (d) they allow for quick

responses, which generates other advantages, e.g., time reduction of data analysis (Spizziri 2000).

Online surveys, however, have three disadvantages over traditional methods. First, response rates are inconsistent (i.e., some e-mail surveys fare better than mail surveys in response rates, some fare worse) (Kim 2001). Second, a related problem with online surveys is the difficulty of obtaining a sampling frame in which every subject in the population has an equal chance of being selected for participation. Lastly, the extreme variations of users' skill and equipment capability also can affect sampling.

Mail survey vs. online survey: The self-administered mail survey is more appropriate for my study than an online survey for the following reasons. First, the self-administered mail survey is relatively more stable, in terms of response rates, than are online surveys (see Table 2-1, p. 44-51). Low response rates are a concern for researchers because answers from survey respondents may differ substantially from those of non-respondents, resulting in a biased estimate of the characteristics of the population. In other words, a low return rate can cast doubt on the reliability of the findings. The mail survey is expected to be better than online surveys, in terms of response rates. Recently, e-mail programs have introduced blocking features, which can prevent Internet users from opening online surveys, along with junk or spam mailings.

Second, my study needed to be, to some extent, free from the contextual bias that might be incurred by a certain medium (e.g., the Internet). The study should compare several media without partiality. Thus, a more neutral medium, i.e., paper-and-pencil type mailings, is preferable in my study. In this sense, the mail survey is more relevant to my study than online surveys.

Mail survey vs. telephone survey: the mail survey using a self-administered questionnaire is also more appropriate for my study than telephone interviews for the following reasons. First, my study aimed at identifying the demand for an interactive television (ITV) prototype from consumers who live nationwide. Mail surveys make large samples feasible at a reasonable cost, compared with other methods, especially telephone surveys that are subject to long distance charges (Babbie 2001).

Second, my study needed a method that can cover *visual* information about ITV. Each respondent was provided with a questionnaire including visual messages about characteristics and functions of a prototypical ITV (see Appendix). In this sense, the mail survey is adaptable to that method (Wimmer and Dominick 1997).

Questionnaire Development

The survey questionnaire included several statements designed to measure respondents' motives in relation to their future usage of interactive television (ITV), their perceptions about ITV's functional similarities with other media, and their perceived control over the future ITV purchase. In constructing the survey items specific to the questionnaire, my study reviewed several previous studies regarding innovation adoption research and industrial reports (Antonides and Raaij 1996; Atkin 1993; Cai 2001; Doll and Ajzen 1992; Dupagne 1999; Eastlick 1996; Fisher and Fisher 1992; Flynn et al. 1996; JMR 2002a; 2002b; Li et al. 1999; Li 2001; Lin 2001; Lin and Jeffres 1998; Madden et al. 1992; Salwen and Stacks 1996).

Measurement

The mail survey included questionnaire items that operationalized several types of variables: Exogenous, endogenous, and other variables. Exogenous variables are defined as those that are not caused by other variables specified in the model, and they are

designated by ξ. Endogenous variables, on the other hand, are those that are caused by other variables specified in the model, and they are designated by η. Based on my research model (see Figure 4-1), the following sections explain each of those variables in detail.

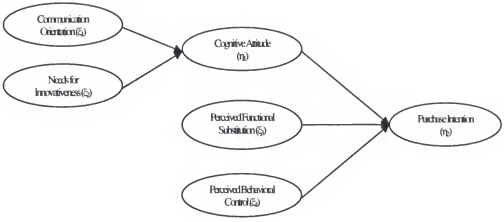


Figure 4-1. A path diagram of an innovation-adoption model

Exogenous Variables

Exogenous variables were (a) communication orientation, (b) needs for innovativeness, (c) perceived functional substitution, and (d) perceived behavioral control (see Table 4-3).

Table 4-3. Exogenous variables

Variable	Operational definition	Measurement
Communication orientation (ξ_1)	The extent to which an individual tries to influence the purchase behavior of others and has a need or desire for engaging in interpersonal communications.	Opinion leadership and information seeking scales (Flynn et al. 1996).
Needs for innovativeness (ξ_2)	The degree to which an individual has a potential psychological need for being innovative for a particular new medium.	Innovativeness trait scale (Lin and Jeffres 1998).
Perceived functional substitution (ξ_3)	The degree to which an individual expects the outcome that a new medium will replace old media, based on his or her own experience with the old media.	Scale adapted from Lin's (2001) and Cia's (2001) studies.
Perceived behavioral control	The sum of products of control belief ratings (about the extent to which an	Three control beliefs (i.e., financial resources,

(ξ_8)	individual perceives ease or difficulty of adopting a new medium) and evaluations about importance of each control belief.	technical concerns, and lack of usage skills) scale (Doll and Ajzen 1992; Fisher and Fisher 1992; Lin and Jeffres 1998; Li et al. 1999; Madden et al. 1992).

Communication orientation: My study used existing scales of opinion leadership and information seeking (Flynn et al. 1996). In order to adapt item wording to a media service choice context, my study revised the statements in the following manner: (a) I often influence people to adopt a media service[7]; (b) when other people choose a media service, they turn to me for advice; (c) I often persuade others to buy the media service that I like; (d) When I consider subscribing to a media service, I ask other people for advice; (e) I don't like to talk to others before I decide to subscribe to a media service; and (f) I feel more comfortable making a decision to subscribe to a media service when I have gotten other people's opinions on it. Each item was scaled from 1 to 5 points (1=strongly disagree, 5=strongly agree).

Needs for innovativeness: The respondents were asked about needs for innovation construct with the following eight items (Lin and Jeffres 1998): (a) I like to try new products; (b) I like to explore new technologies; (c) I like to participate in social activities; (d) I enjoy interacting with my neighbors; (e) compared to my friends, I am in good shape financially; (f) I like to learn about new ideas; (g) I like to keep up with new technologies; and (h) I am willing to take risks in order to try new things. Each item was scaled from 1 to 5 points (1=strongly disagree, 5=strongly agree).

[7] The original wording for this item is "I often influence people to buy a product or service" (Flynn et al. 1996).

Perceived functional substitution: There were three indicators for perceived functional substitution, as adapted from Lin's (2001) and Cai's (2001) studies. Interest in enhanced interactive television (ITV) functions was one of three indicators that suggest how much respondents perceive ITV to be a functional substitute for other media (see Table 4-4).

Table 4-4. Three indicators of perceived functional substitution

Variable	Operational definition	Measurement
Interest in ITV functions	The level of interest an individual has in functionally enhanced features of ITV.	14 functions (JMR 2002a)
Media usage level	The amount of time that an individual usually spends using other competing media - television (e.g., cable television and direct broadcast satellite television), videogame consoles, video cassette recorders, digital video disc players, and the Internet - in a certain period of time.	Media usage level (Lin and Jeffres 1998)
Satisfaction with other media	The degree to which an individual is satisfied with the content of competing media.	Satisfaction with media content (Rubin 1993; Perse and Rubin 1988)

Interest in ITV functions was measured by asking respondents how interested they are in the following functions or services, on a scale of 1 to 5 (1=not at all interested, 5=extremely interested): (a) recording TV programs in an easier way; (b) watching a variety of channels; (c) searching programs by title, genre, actor, etc.; (d) automatically recording programs relevant to my tastes; (e) instantly replaying TV programs; (f) ordering movies on demand anytime; (g) using different camera angles to view program/sporting events; (h) using e-mail; (i) accessing the Internet on TV; (j) pausing live TV programs; (k) skipping commercials; (l) playing along with others on TV game shows; (m) using chat rooms to interact with other viewers; and (n) taking polls/voting.

Those fourteen functions were derived from a commercial report (JMR 2002a), and adapted from the results of the open-ended pretest questionnaire. The interest concept was utilized in an index score, which was calculated by summing the degree of respondent's interest in each of the functions.

Media usage level for each medium also was used as an indicator of perceived functional substitution. The usage level was assessed by self-reports of how much the respondent used or watched a particular medium in a certain period of time (Lin and Jeffres 1998): "How many hours do you spend using or watching each media in a typical week? (cable/satellite/other television services[8], radio, newspapers, magazines, and the Internet)"; and "how many tapes or titles (VHS tapes, DVDs, and game titles) do you rent or purchase in a typical month?" Responses to the seven ranges (0=never, 1=1 hour or less, 2=more than 1 hour and up to 3 hours, 3=more than 3 hours and up to 5 hours, 4=more than 5 hours and up to 7 hours, 5=more than 7 hours and up to 9 hours, and 6=more than 9 hours) were analyzed separately.

Satisfaction with other media was an indicator of perceived functional substitution and was measured on a scale of 1 to 5 (1=not at all satisfied, 5=extremely satisfied): "How satisfied are you generally with each of other media content, such as television programs (via cable/satellite/others), Web content (over the computer), rent or purchased VHS movies, DVDs, and game titles?" The measurement was derived from previous studies (Rubin 1993; Perse and Rubin 1988). For each medium, each item was separately measured and utilized as a variable associated with perceived functional substitution.

Furthermore, overall perceived functional substitution construct was measured directly, asking respondents to rate how substitutable interactive television will be for

[8] Other television services include over-the-air broadcasting, private dish antenna, etc.

other competing media (i.e., cable/satellite/others, the Internet, videocassette recorders, digital video disc players, and video game consoles) in the near future. Three items were used, as shown in Table 4-5. Each item was measured separately according to media type, and then summated to confirm whether each of the aforementioned three indicators was correlated with overall perceived functional substitution.

Table 4-5. Three questions for overall perceived functional substitution

Items	Range
What do you think of ITV services, compared to other media? Are ITV services a substitute for other competing media? Assume that you now use or watch ITV services.	1=extremely supplementary 5=extremely substitutable
Do you disagree or agree with each of the following statements about ITV services? From my perspective, other competing media will be replaced by ITV services. Assume that you now use or watch ITV services.	1=strongly disagree 5=strongly agree
Could you rate the increase or decrease in time spent on other competing media? Assume that you now use or watch ITV services.	1= time increase a lot 5= time decrease a lot

Perceived behavioral control: Three salient control factors that might interfere with the performance of the behavior were resources, complexities of interactive television (ITV) functions, and technical concerns or difficulties (Li et al. 1999). The control factors were measured with six items, as shown in Table 4-6.

Table 4-6. Control factors and six items

Control factor	Item
Resources	ITV services would be very expensive so I could not afford to pay for them
	ITV would be worth extra money that I would be willing to pay beyond what I pay now for my current media use
Complexity	ITV functions would be too complex to easily handle
	ITV would require a lot of time spent learning how to use it
Technical matters	ITV would provide low picture quality
	ITV services would be provided with some technical difficulties (e.g., slow connection speed)

For each control factor, respondents also rated the statement:

"Resources/complexity/technical matters would make it (1=much easier, 5=much more

difficult) for me to purchase or subscribe to ITV services in the near future." The value for each control belief was calculated according to the following formula:

$$\sum_{i=1}^{n} b_i e_i$$

where *b* is the strength of the *i*th control belief about a behavior of interest; *e* is the extent to comply with that belief, and all of the *n* control beliefs are summed (Ajzen and Fishbein 1980). Each of the three control beliefs has two items. Hence, two product terms, in turn, were summed to form the overall value of each of the three control beliefs.

Respondents were also asked about overall perceived behavioral control, which was measured using four items from the scales used by Ajzen and his colleagues (Ajzen and Madden 1986). The measure of control was as follows: (a) for me to purchase or subscribe to ITV services in the near future would be (1=possible, 5=impossible); (b) if I wanted, I could purchase or subscribe to ITV services in the near future (1=definitely true, 5=definitely false); (c) how much control do you believe you will have when you purchase or subscribe to ITV services in the near future? (1=no control, 5=control); and (d) it is mostly up to me whether or not I purchase or subscribe to ITV services in the near future (1=strongly agree, 5=strongly disagree). Similar questions and sets of direct measures were dispersed in the questionnaire to prevent consistent answers, and a mix of positive and negative questions was used in my study.

Endogenous Variables

Based on the research model for my study (see Figure 4-1, p. 72), endogenous variables were (a) cognitive attitude and (b) purchase intention, as summarized in Table 4-7 on the next page.

Table 4-7. Endogenous variables

Variable	Operational definition	Measurement
Cognitive attitude (η_1)	The sum of products of outcome belief ratings about a medium adoption and evaluations about importance of each outcome belief.	Multiattribute model (Antonides and Raaij 1996); Salwen and Stacks 1996)
Purchase intention (η_2)	The degree to which an individual intends to adopt a medium, in terms of general time frame intended for adoption.	Two groups (i.e., non-innovator and innovator) scale modified from Eastlick's (1996) study

Cognitive attitude: The cognitive attitude construct was assessed using multiple items. These multiple items were compiled from the pretest list of the most commonly held outcome beliefs (Ajzen 1991). The eight outcome beliefs of an interactive television (ITV) prototype adoption, which were extracted from the pretest for my study, were "controlling TV programs in a easier way," "watching more shows that fit my tastes," "getting a variety of information about programming," "saving time by doing several things at once," "being more entertained," "instantly communicating with others unlike on traditional television," "being free from advertisements," and "having personal privacy violated." These outcome beliefs were measured using a five-item semantic differential scale (1=extremely unlikely, 5=extremely likely).

The importance evaluations about the beliefs were measured by asking subjects to respond to the question corresponding to the belief of each outcome belief, using a scale ranging from 1 to 5. The score of importance evaluation, in turn, was multiplied by the belief score and then each product was used as an indicator of cognitive attitude, with higher numbers indicating more favorable attitudes toward ITV adoption.

My study also measured overall attitude toward ITV adoption. Attitude was simply referred to as "the person's judgment that performing the behavior is good or bad, that he is in favor of or against performing the behavior" (Ajzen and Fishbein 1980,

p. 6). The direct measurement of a respondent's overall attitude enabled my study to assess whether aforementioned outcome beliefs were related with overall attitude toward interactive television adoption.

Empirical research has shown that attitude often contains two separable components (Ajzen 1991). One component is instrumental in nature, characteristic of such adjective pairs as valuable --- worthless, and harmful --- beneficial. The other is experiential and represented by such scales as pleasant --- unpleasant and enjoyable --- unenjoyable. Good --- bad also tends to assess overall evaluation very well (Ajzen 1991). Thus, my study incorporated these five components and directly asked a respondent to rate the future ITV adoption using a five-item semantic differential scale.

Purchase intention: Respondents were asked three short questions to measure purchase intention. These three items are commonly used in studies assessing the theory of reasoned action (Ajzen 1991): (a) I intend to purchase or subscribe to ITV services in the near future; (b) I will try to purchase or subscribe to ITV services in the near future; (c) I plan to purchase or subscribe to ITV services in the near future. Each value from the three items was used to estimate the degree of purchase intention. Those items were measured with a five-item semantic differential scale (1=extremely unlikely, 5=extremely likely).

Other Variables

To assess the research questions in my study, other variables were included: (a) demographics, (b) adoption cluster, (c) awareness (see Table 4-8).

Table 4-8. Other variables

Variable	Operational definition	Measurement
Demographics	Age, gender, education, family size, and household income.	Adapted from U.S. Census Bureau 2000 data categories

Adoption cluster	The number of media devices that an individual owns in his or her home.	Technology ownership (Atkin 1993; Dupagne 1999; Li 2001)
Awareness	The number of ITV-associated terminologies with which an individual is familiar.	Awareness (Dupagne 1999)

Demographics: To obtain demographic data, respondents were asked their age, gender, education, family size, and level of house income. A ratio scale was used for age (years) and family size (number of family members), while a categorical scale was used for gender (1=male, 2=female). Ordinal scales were used for levels of education and household income. Specifically, education was categorized from "1=post-graduate" to "7=eighth grade or less" and "8=others." Income was measured from "1=under $15,000" to "7=above $90,000."

Adoption cluster: The adoption cluster concept has been related to viewers' media ownership (or repertoires) in the adoption of innovations literature (Atkin 1993; Dupagne 1999; Li 2001). My study operationally defined adoption cluster as the number of media devices or services that an individual owned in his or her home.

Respondents were asked to identify their ownership of each of the 13 different commonly adopted communication technologies or services presented to them. These thirteen categories included cable services (i.e., basic, expanded basic, premium, and digital cable), satellite dish (i.e., DirectTV), other satellite services, videocassette recorders, digital video disc players, dial-up Internet access, high-speed Internet access, personal video recorders, video game consoles, and WebTV/UltimateTV/AOLTV. An index score was calculated by summing the number of units each respondent owned or to which he or she had subscribed.

Awareness: My study operationally defined awareness as the number of interactive television (ITV) -associated terminologies with which an individual was familiar (Dupagne 1999). The question associated with the awareness concept was used to confirm whether the level of awareness would affect the responses on several other questions. My study tested a t-test statistic between those who were well aware of ITV terminologies and those who were less aware of them, using a separation criterion, namely, the median.

Respondents were asked to mark the terms they had heard before, such as ITV (interactive television), VOD (video-on-demand), PVRs (personal video recorders), HDTV (high-definition television), IPG (interactive program guide), and online video games via television. In order to prevent awareness bias from respondents' answers, the questionnaire offered respondents a brief description about what ITV services entail. The description was presented in easy and plain words, along with a picture of an interactive television screen (see Appendix), as follows:

> If you like to watch movies, you can order and watch them anytime by selecting video-on-demand from a drop-down ITV menu bar. It is possible to record, store, and play-back TV programs you are watching. It is similar to video-cassette recorders, but easier to operate. Some interactive programs also enable you to play along with game shows, to play video games with your neighbors while instant-messaging them, and to send e-mails to others.

The questionnaire also provided respondents with an explanation about how to operate or handle ITV:

> When interactive programs are available, you can see some icons appear in the upper right corner of the screen or on the drop-down menu bar. You can just

simply press the icons if you want to access information about specific programs or to buy some products and services on the TV.

Validity and Reliability Tests

Validity means the extent to which a measurement adequately reflects the real meaning of the concept of interest. Reliability is a matter of whether a particular technique, applied repeatedly to the same object, generates the same result each time. Reliability, however, does not guarantee accuracy any more than validity does. Thus, concerns of reliability and validity involve trade-offs between precision and accuracy.

There are various kinds of validity used for research critiques. Criterion-related validity (i.e., predictive validity) is based on some external criterion, while construct validity is based on the logical relationships among variables. Content validity refers to how much a measure covers the range of meanings included within a concept. This validity is also known as face validity, which "subjectively assesses the correspondence between the individual items and the concept through ratings by expert judges, pretests with multiple subpopulations, or other means" (Hair et al. 1998, p.117). To test these kinds of validity, my study will use factor analyses and model comparison tests in Chapter Five.

Reliability refers to test-retest reliability involving the re-administration of a measure to the same group of subjects at two points in time. Responses should not be too varied across time periods so that a measurement taken at any point in time is deemed reliable. Internal consistency reliability, on the other hand, addresses the item-to-item consistency of subjects' responses. This type of reliability is measured using Cronbach's alpha, which is the extent to which there would be correlations among indicators or items

that represent a latent factor or construct. An alpha of .70 is the low limit that is generally agreed upon (Hair et al. 1998). A value of .70 means that 30% of the total variance is due to random effects of content heterogeneity.

My study tested the internal consistency of the multi-item scales that pertained to the endogenous and exogenous variables for my study (see Table 4-9).

Table 4-9. Cronbach's alphas of endogenous and exogenous variables

Variable		Number of items	Alpha
Communication orientation		6	.757
Needs for innovativeness		8 → 4	.672 → 876[a]
Perceived functional substitution	- Existing television services	3	.735
	- The Internet	3	.615
	- Videocassette recorders	3	.756
	- Digital video disc players	3	.629
	- Video game consoles	3	.714
Perceived behavioral control		4	.797
Cognitive attitude		5	.717
Purchase intention		3	.953

[a] This is an improved value of alpha obtained after deleting four of the eight items.

All but three variables (i.e., two perceived functional substitution variables and one needs for innovativeness variable) had higher than .70 Cronbach's alpha, which implied that there existed consistency between multiple measurement of each of those variables.

Two perceived functional substitution variables that had a Cronbach's alpha less than .70 were the Internet (α=.615) and digital video disc player (α=.629) items, which might not measure the same construct (see Table 4-9). Nonetheless, given that the lower limit of Cronbach's alpha could decrease to .60 in the case of exploratory research (Hair et al 1998; Rubinson et al. 1991), those values of .615 and .629 were above this necessary level of internal consistency. Those variables, thus, could be utilized to test whether their correlations exist with the three indicators of perceived functional substitution (i.e.,

interests in interactive television functions, media usage level, and satisfaction with other media).

Needs for innovativeness were measured on an eight-item scale. Its Cronbach's alpha was below .70. The eight-item scale, thus, needed to be improved to suit the actual data because the scale might have incurred a serious iteration problem (sometimes due to measurement errors) in the structural equation model (Kline 1998). By eliminating the four unreliable items (i.e., I like to participate in social activities/ I enjoy interacting with my neighbors/ Compared to my friends, I am in good shape financially/ I am willing to take risks in order to try new things), the Cronbach's alpha for needs for innovativeness increased to .87, which otherwise would have remained below the generally accepted reliability level (see Table 4-9 on the previous page). This reduced four-item scale was more reliable than the eight-item scale, thereby being applied to the structural equation model used in my study.

Statistical Analysis

After conducting validity and reliability analyses, my study took several steps to answer the two research questions and five hypotheses. Several main statistical techniques were applied to analyze the collected data. An exploratory factor analysis was used to answer the first research question about outcomes or motives for an interactive television (ITV) prototype. This method was also used to identify the structure of the interrelationships among a number of outcome beliefs, by defining a set of common underlying dimensions (Hair et al. 1998).

A logistic regression was conducted to identify which of the predictors of the intent to adopt ITV differentiate between the two adoption intention groups (i.e., non-innovator and innovator groups), which served as criterion variables. The results of these analyses

provided each profile of the potential adoption intention groups. For instance, media users with a stronger need to use multitasking functions of ITV tend to be innovators. This analysis, therefore, might be very helpful in developing effective marketing strategies targeted to a variety of media user characteristics.

My study also utilized a structural equation model (SEM) approach to analyze the study's five hypotheses and the second research question. In the following section, my study details the advantages and disadvantages of SEM, and then justifies SEM as one of primary statistical methods for my study.

Structural Equation Modeling

Structural equation modeling (SEM) is a multivariate technique combining aspects of path analysis and factor analysis. SEM simultaneously estimates a series of interrelated dependence relationships (Hair et al. 1998). In this sense, SEM is similar to path analysis. SEM also provides a measurement model that specifies the relations between observed and latent variables (i.e., factors), like factor analysis. However, there is a big difference between each of these two methods and SEM. Unlike path analysis, SEM has the ability to represent unobserved (or latent) concepts in the relationships. SEM can also account for measurement errors in the estimation process, which are not considered in factor analysis. Thus, SEM is most useful in studies that attempt to construct a model with various theoretically distinguishable, latent constructs.

Advantages: Structural equation modeling (SEM) approach has some advantages. First, it can simultaneously estimate measurement errors and the relationships among theoretical constructs. Measurement error is the degree to which the observed values are not representative of the true values. As a matter of fact, the relationship between two constructs may disappear when external common causes of

both are partialed out. In other words, the impacts of these measurement errors, i.e., external common causes, mask the relationships between the two constructs. To reduce the risk of spurious relationships, researchers should take into account measurement error correlations. In this sense, SEM is superior to other techniques (e.g., multiple regression, path analysis).

Second, SEM is robust against violations of the assumption of the independence of the residual or error terms, unlike regression analysis. Empirically, it is very difficult to meet the important assumption that there is no correlation between the error terms of the dependent variables and other independent variables. Even if the assumption is violated, SEM does not have to remedy data to satisfy such an impractical assumption (Kline 1998).

Third, SEM is free from spurious associations incurred by multicollinearity, or the correlations among two or more predictors in explaining the variance of a dependent variable. Spurious associations between an independent variable and a dependent variable disappear when controlling for other explanatory variables. As multicollinearity increases, it complicates the interpretation of a variate because it is difficult to isolate the effect of any single variable due to the problematic interrelationship with other variables. With SEM, the interrelationships among variables are first tested, screened by a factor analysis and then constructed in a model with the paths that explicate the multiple associations among the variables. Thus, a multicollinearity test is not necessary for SEM. Rather, some levels of multicollinearity among the variables is preferable in the SEM approach (Hair et al. 1998).

Last but not least, SEM enables researchers to compare several models representing the structure or relationships among constructs and to determine the best model using the goodness-of-fit tests. More solid relations can then be inferred from the best model that fit the concurrent data.

Disadvantages: Structural equation modeling (SEM), however, has two main drawbacks. First, SEM can incur problems of "subjectivity," even though it may be based on a theory that offers the rationale for almost all aspects of the structural equation model. A theory-based approach is very important because the lack of theoretical backgrounds or rationale makes a structural equation model significantly different from real-world behavior (Kline 1998). The theory-based approach, however, cannot specify all relationships among constructs and their error terms (Jöreskog and Sörbom 1997). Some structures of SEM can be partially specified by the researcher's own decision. For instance, researchers often specify covariances among the error terms of exogenous variables without any theoretical background.

Second, SEM tends to make arbitrarily choices regarding orthogonal and oblique factor rotation methods in a measurement model. For instance, extracted factors presumably can be orthogonal (i.e., uncorrelated), if researchers need to avoid complications in their use, as in other multivariate techniques. This is subjective, not a statistical matter. In this sense, this method does not guarantee the objectivity that is essential to social science.

Rationales: Despite the aforementioned disadvantages, structural equation modeling (SEM) was utilized as one of the main statistical methods in my study. First, my study required relatively solid statistical methods because data collection process (i.e.,

questionnaires in a self-report form) was anticipated to produce measurement errors. Specifically, the random errors might occur if subjects answered questions in an unusual, noisy environment, which was uncontrolled by researchers who administered the mail survey.

Second, my study attempted to build an integrated model with a variety of theoretical contructs. As noted earlier, SEM is most relevant to studies that intend to identify the structures underlying complex constructs in an integrated model.

Finally, my study further aimed at finding the best model that allowed for the estimation or prediction of intent to adopt a new medium (i.e., interactive television). To achieve the purpose, it was necessary to use SEM to compare several alternative models. SEM was the most appropriate method for an adoption decision model that best fits the actual data.

CHAPTER 5
RESULTS

This chapter consists of five parts. First, a description of the collected data is provided. Second, the results of correlation analysis between the main variables and their indicators are discussed. Third, the structural equation modeling is explicated in terms of a series of factor analyses, the measurement model, the base model, and other competing models. Fourth, the hypotheses are tested based on the base model, and the results of the hypothesis tests, along with the research questions, are reported. Finally, the results of a logistic regression are presented with regard to two adoption intention groups.

Descriptive Data Analysis

A nationwide mail survey was conducted in the United States on April 21, 2003. 1,500 surveys were sent to randomly sampled Internet users. Three weeks after the first mailing, the nonrespondents were sent both a letter of additional encouragement to participate in the survey and a new copy of the survey questionnaire. It took almost three months to complete the mail survey. The response rate increased 6.8% after the follow-up mailing.

403 out of 1,500 mailings were finally collected at response rates of 22.1%, 23.5%, and 24.5%, based on Response Rate 1 (RR1), Response Rate 2 (RR2), and Contact Rate formulas, respectively (see Table 5-1). 20 incomplete, 16 refusal, and 35 non-deliverable surveys were calculated by these formulas.

Table 5-1. Response Rate Calculations [a]

Type of response rate	Formula	Application	Result
RR1	Complete/total (=complete + incomplete + refusal + non-deliverable + others)	332/1500	= 22.1%
RR2	(complete + incomplete)/total	(332 + 20)/ 1500	= 23.5%
Contact rate [b]	(complete + incomplete + refusal)/total	(332 + 20 + 16)/1500	= 24.5%

[a] Source: American Association for Public Opinion Research (AAPOR 2003).
[b] Contact rate measures the proportion of all cases in which some responsible member of the housing unit was reached by the survey.

After eliminating 20 responses that included incomplete data, the same numbers throughout the questionnaire, or intentional wrong answers beyond the range of the scales, the study considered a total sample size of 332 for the data analysis.

Demographics

Of the 332 respondents in the sample, 49.1% (N=163) were males and 50.9% (N=169) were females. The sample had a median age category of 35-44 of age. Regarding the age distribution, 37.6% (N=125) of respondents were between 18 to 34 years old; 53.3% (N=171) were between 35 to 54 years old; and 8.1% (N=27) were 55 or more. More middle-age respondents (i.e., 35-54 years old) participated in this survey, when compared to the population of Internet users for that age category of U.S. Census 2000 (U.S. Bureau of the Census 2002; see Table 5-2).

Table 5-2. Sample profile comparison

Categories		Distribution	
		Interactive TV study Total adults=332	U.S. Census 2000 Total adults who have any online usage=90,458,000
Age	18 to 34 years old	37.6%	39.7%
	35 to 54 years old	53.3%	47.7%
	55 years old and over	8.1%	12.7%
Gender	Male	49.1%	49.8%
	Female	50.9%	50.2%
Education	Graduated college plus	37.0%	38.0%
	Attended college	57.9%	34.8%
	Did not attend college	5.1%	27.2%

Family size	1 to 2 persons	35.2%	40.2%
	3 to 4 persons	50.3%	44.4%
	5 or more persons	14.5%	15.4%
Income	Less than $50,000	17.8%	33.6%
	$50,000 to $74,999	22.6%	26.2%
	$75,000 or more	59.7%	40.2%

Almost all respondents (94.9%, N=315) attended at least some college and were higher educated, when compared with general Internet users in the population (72.8%). Most (85.5%, N=284) have 1-4 persons as family members. The distribution of family size in the sample was similar to one in the population of Internet users (84.6%).

As for income, 59.7% (N=198) of the respondents reported their annual household income as "$75,000 or more," followed by "$50,000 to $74,999" (22.6%, N=75), and "less than $50,000" (17.8%, N=59). The sample had a median annual household income category of "$60,000 to $74,999." The levels of participants' household income were higher in this survey than ones in the general population of Internet users (see Table 5-2). It could be inferred that the characteristics of this survey, which dealt with media or electronic devices generally deemed as high-involvement or expensive products, might not attract those who had income less than $50,000.

Only with regard to gender and family size did the demographic profile of the sample approximate the actual profile of the U.S Census Bureau 2000 data. As a result, the sample could be partially representative of all Internet users living in the U.S., aged 17 and over.

Adoption Cluster

The adoption cluster was measured by counting how many of thirteen communication technology categories[9] each respondent subscribed to/owned. The sample had 4.34 categories on average, and 96.6% of all respondents had three or more communication technologies. This result was suitable for the purpose of my study, which is to have multimedia users sampled.

Awareness

My study revealed that 95.5% of all respondents were aware of at least one of the terms associated with interactive television, such as ITV (interactive television), VOD (video-on-demand), PVRs (personal video recorders), HDTV (high-definition television), IPG (interactive program guide), and online video games via television. Respondents reported a median awareness of three of the six terms.

My study examined whether the level of awareness would affect the responses to questions on main variables. A t-test statistic was utilized between those who were well aware of terms (N=121) and those who were less aware of them (N=211), with a median value of three as the separation criterion. The study found that although the questionnaire offered respondents a brief description about what ITV services entail, there existed some awareness bias in respondents' answers to a few questions. For instance, there were significant differences between the means of the two groups' interests in ITV functions (t value=- 2.941, $p < .01$). As a result, my study failed to keep the levels of awareness about

[9] These categories include (a) basic cable, (b) expanded basic cable, (c) premium cable, (d) digital cable, (e) satellite dish (i.e., DirectTV), (f) other satellite services, (g) videocassette recorders, (h) digital video disc players, (i) dial-up Internet access, (j) high-speed Internet access, (k) personal video recorders, (l) video game consoles, and (m) WebTV/UltimateTV/AOLTV.

an ITV prototype constant. In this sense, the overall findings of my study could be limited in terms of generalizability. This issue will be revisited in Chapter Six.

Media Usage Level

Five types of media use were taken into consideration: (a) television (cable/satellite/other television services, e.g., private dish and territorial broadcasting), (b) Internet access, (c) videocassette recorders (VCRs), (d) digital video disc (DVD) players, and (e) video game consoles.

The number of television viewers was 325 (98% of total respondents), including 242 cable users (74%; pure cable users=186), 72 satellite television users (22.1%; pure satellite users=62), and 44 other television users (13.5%; pure other television users=29). Almost 15% of all television viewers utilized two or more services simultaneously. The median television usage level for the sampled television viewers was between five and seven hours in a typical week.

As for Internet usage level, respondents used the Internet from three to five hours in a typical week. On average, 58.6% and 72.8% of all respondents used 1.4 VHS and 1.58 DVD movie titles during a typical month, respectively. In addition, only 26.7% of all respondents played 1.32 video game titles on video game consoles during a typical month.

Satisfaction with Other Media

Five types of other media content were treated in my study: (a) television programs (via cable/satellite/others), (b) Web content (over the computer), (c) rented or purchased VHS movies, (d) DVD, and (e) game titles. The median satisfaction level was "moderately satisfied" with those five media content. Respondents were mostly satisfied with DVD movies (mean=3.25, SD=.92), followed by VHS tapes (mean=3.10, SD=.80)

and Web content (mean=3.09, SD=.85). On the other hand, respondents were relatively less satisfied with television programs (mean=2.92, SD=.84) and game titles (mean=2.77, SD=1.01).

Outcome Beliefs (or Motives)

The respondents thought somewhat strongly that most of the outcome beliefs regarding interactive television (ITV) would be likely to take place in the near future, based on an overall average score of 3.3 (1=extremely unlikely, 5=extremely likely). For instance, 86.1% of all respondents believed that the ITV functions associated with controllable viewing (mean=3.49) would be implemented in reality (see Table 5-3).

Table 5-3. Outcome beliefs about ITV

(Rank) Outcome belief	Mean	Percent 1 (=extremely unlikely)	3 (=somewhat likely)	5 (=extremely likely)
Controllable viewing (Mean=3.49)				
(1) Watching more shows that fit my tastes	3.58	13.8%	28.0%	58.1%
(2) Getting a variety of information about programs	3.46	14.5%	34.0%	51.4%
(3) Controlling television programs in an easier way	3.44	13.8%	36.9%	49.2%
Advertisement Intrusion (Mean=3.39)				
(4) Being free from advertisements	3.42	24.5%	19.5%	56.1%
(5) Having personal privacy violated	3.36	24.1%	24.5%	51.4%
Multitasking (Mean=3.02)				
(6) Being more entertained	3.27	19.1%	37.6%	43.2%
(7) Saving time by doing several things at once	2.97	33.5%	32.4%	34.2%
(8) Instantly communicating with others unlike traditional TV	2.83	36.5%	37.9%	25.6%
N = 332				

As for outcome beliefs associated with concerns about interactive advertisement intrusion, respondents showed a somewhat high likelihood (mean=3.39) that "being free from ads" (75.6%) and "having personal privacy violated" (75.9%) would occur in the near future. In addition, most respondents (ranging from 63.5% to 80.8%, mean=3.02) tended to believe that ITV would include multitasking functions sooner or later.

Interests in ITV Functions

Table 5-4 shows how interested respondents were in enhanced interactive television (ITV) features. A majority of respondents expressed moderate interests in ITV functions, based on an overall average score of 3.1 (1=not at all interested, 5=extremely interested).

Table 5-4. Interests in ITV functions

(Rank) ITV functions	Mean	Percent		
		1 (=not at all interested)	3 (=somewhat interested)	5 (=extremely interested)
PVR/VOD functions (Mean=3.23)				
(1) Skipping commercials	4.19	7.8%	16.4%	75.9%
(2) Recording TV programs in an easier way	3.23	25.4%	35.3%	39.2%
(3) Pausing live TV programs	3.21	25.0%	34.9%	40.1%
(4) Ordering movies on demand anytime	3.18	26.3%	36.6%	37.0%
(5) Searching programs by title, genre, actor…	3.11	29.7%	34.9%	35.4%
(6) Watching a variety of channels	3.08	28.9%	32.8%	38.4%
(7) Recording programs relevant to your tastes	2.95	36.2%	32.3%	31.4%
(8) Instantly replaying TV programs	2.93	38.4%	30.6%	31.0%
Internet functions (Mean=2.67)				
(9) Using e-mail	2.73	46.1%	25.4%	28.4%
(10) Accessing the Internet	2.62	45.7%	31.9%	22.4%
Advanced TV functions (Mean=2.12)				
(11) Using different camera angles	2.63	48.3%	31.5%	20.3%
(12) Playing along with others on game shows	2.20	65.1%	21.1%	13.8%
(13) Taking polls/voting	2.01	72.8%	18.5%	8.6%
(14) Using chat rooms to interact with others	1.67	85.3%	10.3%	4.3%
N = 332				

Almost 60% of all respondents gave somewhat high ratings to the ITV functions associated with personal video recorders (PVRs) and video-on-demand (VOD), yielding an average score of 3.23. More specifically, among PVRs-associated features, respondents are mostly interested in "skipping commercials" (92.3%), followed by "pausing live TV programs" (75%), and "recording TV programs in an easier way" (74.5%). In terms of VOD function, respondents were also highly interested in "ordering movies on demand anytime" (73.6%).

As for Internet functions, respondents expressed relatively less interest (mean=2.67) in "accessing the Internet" (54.3%) and "using e-mail" (53.8%), when compared with the PVR and VOD functions. A majority of respondents were even less interested (mean=2.12) in advanced television features such as "taking polls/voting" and "using chat rooms to interact with other viewers."

Correlation Analysis

The correlation analysis for my study examined the adequacy of the sets of outcome beliefs and control beliefs, which represent overall attitude toward interactive television (ITV) adoption and perceived behavioral control over ITV purchase, respectively. In fact, those beliefs were valid in providing more specific information about the intent to adopt ITV than the pure or overall attitude and perceived behavioral control measure. For instance, the outcome beliefs allowed the researcher to capture the specific and articulated factors that underpin respondents' own motivations.

The pretest for my study and other previous studies uncovered several salient outcome and control beliefs (Li et al. 1999; Lin and Jeffres 1998). The correlations between each belief and overall attitude or overall perceived behavioral control were presented, along with the correlations between the sum of the belief product terms and the overall attitude or perceived behavioral control.

All eight specific outcome beliefs were significantly correlated with the overall attitude toward ITV adoption behavior (see Table 5-5 on the next page). These correlations ranged from .162 to .344. The correlation between the sum of the outcome beliefs and the overall attitude also was significant ($r=.387$, $p< .01$).

Table 5-5. Correlations of motives (outcome belief product terms) with overall attitude

Outcome belief	Overall attitude
Controlling television programs in an easier way	.237**
Watching more shows that fit my tastes	.282**
Getting a variety of information about programs	.299**
Saving time by doing several things at once	.278**
Being more entertained	.310**
Instantly communicating with others unlike traditional television	.344**
Being free from advertisements	.162*
Having personal privacy violated [a]	.218**
r, attitude with the sum of outcome beliefs	.387**
N = 332	

[a] This item was asked in a reverse order of 1-5 unipolar scale.
** Significant at the .01 level.
* Significant at the .05 level.

All six specific control beliefs were significantly correlated with overall perceived behavioral control, and these correlations ranged from .411 to .660 (see Table 5-6). The correlation between the sum of the control beliefs and the overall perceived behavioral control was slightly higher ($r=.663$, $p< .01$), than that of the outcome beliefs.

Table 5-6. Correlations of controls (control belief product terms) with overall perceived behavioral control

Control belief	Overall perceived behavioral control
ITV services would be so expensive that I could not afford to pay for them [a]	.660**
ITV would be worth extra money that I would be willing to pay beyond what I pay now for my current media use.	.623**
ITV functions would be too complex to handle easily [a]	.500**
ITV would require a lot of time spent learning how to use it [a]	.487**
ITV would provide low picture quality [a]	.512**
ITV services would be provided with some technical difficulties (e.g., slow connection speed) [a]	.411**
r, control with the sum of control beliefs	.663**
N = 332	

[a] The 1-5 unipolar scale of this item was arranged in a reverse order.
** Significant at the .01 level.
* Significant at the .05 level.

Based on the results of the correlation analyses, the study found that all indicators in attitude and perceived behavioral control constructs could properly represent the respective construct in interpreting the interrelationship among other constructs (e.g.,

purchase intention). As mentioned in the previous chapter, three indicators of perceived functional substitution (i.e., media usage level, satisfaction with other media, and interest in ITV functions) were utilized to identify how each of the variables was correlated with overall perceived functional substitution.

Table 5-7. Correlations of other media usage level and satisfaction with overall perceived functional substitution

	Overall perceived functional substitution				
	TV	Internet	VCR	DVD	Game console
Other media usage level					
Cable/satellite/other TV services	-.094				
Internet over TV		-192**			
VCR			-176**		
DVD				-093	
Game consoles					.008
Satisfaction with other media					
TV services	-.056				
Internet over TV		-091			
VCR			-188**		
DVD				-062	
Game consoles					-147*
N=332					

** Significant at the .01 level.
* significant at the .05 level.

As shown in Table 5-7, Internet usage level was negatively related to overall perceived functional substitution ($r=-.192$, $p< .01$). The time spent using VCRs also was negatively related to the perception of ITV's functional substitution for VCRs ($r=-.176$, $p< .01$). In other words, the less time respondents spent using the Internet, the more likely they were to perceive that Internet access and VCRs would be replaced with ITV. However, television, DVD, and game console usage levels were not correlated with overall perceived functional substitution.

According to the results from satisfaction with other media (see Table 5-7), those who were less satisfied with VHS movie viewing ($r=-.188$, $p< .01$) and video game consoles or game titles ($r=-.147$, $p< .01$) were more likely to perceive ITV as a substitute

for those other media.

Table 5-8. Correlations of interest in ITV functions with overall perceived functional substitution

	Overall perceived functional substitution				
	TV	Internet	VCR	DVD	Game console
Interest in ITV functions					
Recording TV programs in an easier way	.275**	.087	.347**	.257**	.188**
Searching programs by title, genre, actor, etc…	.276**	.017	.219**	.172**	.141*
Watching a variety of channels	.201**	.087	.207**	.209**	.140*
Recording programs relevant to your tastes	.141*	.166*	.183**	.178**	.194**
Instantly replaying TV programs	.121	.087	.155*	.140*	.069
Ordering movies on demand anytime	.204**	.212**	.408**	.378**	.311**
Using different camera angles	.153*	.106	.188**	.207**	.149*
Using e-mail	.105	.245**	.131*	.199**	.186**
Accessing the Internet	.179**	.289**	.169**	.240**	.247**
Pausing live TV programs	.271**	.093	.246**	.148*	.140*
Skipping commercials	.192**	.098	.235**	.115	.131*
Playing along with others on TV games show	.073	.190**	.110	.169**	.139*
Using chat rooms to interact with other viewers	.100	.146*	.094	.175**	.187**
Taking polls/voting	.048	.129*	.175*	.106	.140*
r, each PFS with the sum of interests	.275**	.233**	.338**	.318**	.278**
N=332					

** Significant at the .01 level.

* significant at the .05 level.

Interest in ITV functions was positively correlated with overall perceived functional substitution (see Table 5-8), although the values of correlations varied across the media types. More specifically, interest in ITV functions had positive relationships with the perceptions of ITV's functional substitution for VCRs (r=.338, p< .01), DVDs (r=.318, p< .01), game consoles (r=.278, p< .01), and television (r=.275, p< .01). This means that the more interested people are in ITV functions, the more likely people are to perceive that VCRs, DVDs, and game consoles will be functionally replaced by ITV.

Developing a Structural Equation Modeling

Prior to the structural equation modeling, the study conducted an exploratory factor analysis to search for an underlying structure among a set of outcome beliefs of attitude toward interactive television (ITV) adoption. Those variables were extracted

from a pretest, and thus it was necessary to reduce the number of variables measured in my study, ensuring the model's parsimony.

The exploratory factor analysis further created summated scales for subsequent multivariate analyses, namely the structural equation modeling. For instance, if some of the observed variables (e.g., controlling television shows in an easier way and getting a variety of information about programs) highly were loaded on a certain common factor (e.g., controllable viewing), they were summated and averaged to create a solid scale that best represents the factor. The summated scales reduce measurement errors by using multiple indicators to decrease the reliance on a single variable, while maintaining parsimony in terms of the number of observed variables (Hair et al 1998).

The exploratory factor analysis also included validity and reliability tests, which laid statistical foundations on the construction of newly developed scales (Byrne 2001). For instance, the factor analysis offered an empirical assessment of the summated scales (i.e., factor loading values) in terms of their convergent and discriminant validity. Convergent validity assessed the degree to which two or more observed variables of the same concept or construct were correlated, while discriminant validity assessed the degree to which two conceptually similar constructs were distinct (Hair et al. 1998). In addition, the consistency of the multi-item scales (i.e., reliability) was examined through Cronbach's alphas for the observed variables that loaded high on a certain factor. My study first tested the assumptions of factor analysis, and then provided the results of the exploratory factor analysis for the outcome beliefs representing cognitive attitude.

Assumptions of Factor Analysis

Factor analysis has some critical assumptions, which are more conceptual than statistical (e.g., normality, linearity, and homoscedasticity), unlike some dependence

techniques such as multiple regressions. The conceptual assumptions are as follows: (a) some underlying structure does exist in the set of selected variables, e.g., independent variables should be separate from dependent variables in conducting factor analysis; and (b) the sample is homogenous regarding the underlying factor structure. These assumptions are usually dealt with in a structural equation modeling. Only normality should be necessary in the test of statistical significance of factors (Hair et al. 1998).

The normality of all variables was tested using the skewness and kurtosis values of outcome beliefs. According to Hair et al. (1998), the calculated values of skewness and kurtosis exceeding ±2.58 (i.e. a critical value at the .01 level) reject the assumption of a normal distribution. As shown in Table 5-9, all outcome belief items had no values of skewness and kurtosis exceeding ±2.58. Thus, the outcome beliefs met the normality statistical assumption for a factor analysis.

Table 5-9. Outcome beliefs

Outcome belief	Skewness	Kurtosis	MSA
Controlling television programs in an easier way	.615	.149	.84
Watching more shows that fit my tastes	.276	-.358	.83
Getting a variety of information about programs	.477	-.161	.80
Saving time by doing several things at once	.730	-.028	.74
Being more entertained	.469	-.154	.90
Instantly communicating with others unlike traditional TV	1.013	.980	.77
Being free from advertisements	.203	-1.158	.59
Having personal privacy violated [a]	.257	-.973	.60
N = 332			

[a] The 1-5 unipolar scale of this item was arranged in a reverse order.

There are two primary statistical methods that are usually used to determine whether a factor analysis is appropriate to the collected data. First, the Bartlett test of sphericity offers the statistical probability that a correlation matrix has significant correlations among at least some of the variables. All outcome beliefs had significant correlation values (i.e., χ^2=793.98, df=28, and p< .01). These outcome belief variables,

therefore, were suitable to a factor analysis.

Second, the results of the overall measure of sampling adequacy (MSA) also allow researchers to determine whether they should proceed with the factor analysis (Hair et al. 1998). This measurement can be interpreted using the following standard: .80 or above, meritorious; .70 or above, middling; .60 or above, miserable; and below .50, unacceptable. The overall MSA value for the outcome beliefs was .828. Thus, these variables met the meritorious level of sampling adequacy for a factor analysis.

Exploratory Factor Analysis

An exploratory factor analysis was conducted to identify an expected or hidden structure among several outcome beliefs. The structure of those variables could vary, depending on how many factors were finally selected in the factor analysis. My study utilized a scree test in selecting the number of factors, rather than latent root criterion of 1.00 or higher.

The scree test indicated that three factors were appropriate to explain the underlying structure of outcome beliefs. As shown in Table 5-10 on the next page, the eigenvalue of the third factor was close to one, and it was, therefore, considered for inclusion in the structure of outcome beliefs (Hair et al. 1998). As a matter of fact, if the study applied the latent root criterion to the data, two factors would have been retained, and the two-factor solution (accounting for 64.41% of variance) could lose a great deal of information about the outcome beliefs (or motives) of interactive television adoption. Therefore, based on the scree test, the study selected the three-factor solution, which accounted for 76.61% of the variance.

Table 5-10. Factor analysis for outcome beliefs

Variables [a]	Factor loadings			Communality
	1	2	3	
Factor 1 Controllable viewing				
Controlling television programs in an easier way	.828			.721
Watching more shows that fit my tastes	.833			.726
Getting a variety of information about programs	.853			.784
Factor 2 Multitasking				
Saving time by doing several things at once		.807		.741
Being more entertained		.528		.652
Instantly communicating with others unlike traditional television		.846		.771
Factor 3 Advertisement Intrusion				
Being free from advertisements			.908	.858
Having personal privacy violated [a]			.912	.876
Eigenvalue	3.726	1.426	.976	
Cronbach's alpha	.838	.746	.842	
Percentage of the total variance explained	46.575	17.831	12.204	
Total percentage		76.609		

[a] The 1-5 unipolar scale of this item was arranged in a reverse order.

It was crucial to assess the validity and reliability of the outcome beliefs because, unlike other aforementioned scales (e.g., communication orientation and needs for innovativeness), outcome beliefs were extracted from the pretest of my study. As shown in Table 5-10, all items' factor loadings were higher than .40, which is the minimum factor loading level (Hair et al. 1998). An examination of the inter-item correlations among a set of observed variables (i.e., Cronbach's alpha) also was significant at the .01 level. Hence, the three-factor solution had good convergent validity.

My study utilized an orthogonal varimax rotation in the factor analysis, which assumes that all factors are mathematically independent (Hair et al. 1998). That rotation could, to some extent, lead to an increase in the discriminant validity in this factor analysis. In addition, the three factors had .84, .75, and .84 as internal reliability alpha coefficients, respectively, which suggested that the all three factors had acceptable

reliability.

The next step of the exploratory factor analysis was to assign names suitable to the three factors. As shown in Table 5-10 on the previous page, the first factor was named "controllable viewing," based on the common nature (i.e., controlling TV viewing in terms of time and viewing options) of three items in that factor. The second factor was labeled "multitasking," summarizing only two items (i.e., saving time by doing several things at once and instantly communicating with others). In fact, one of the items (i.e., being more entertained) in the second factor had a relatively low factor loading (i.e., .528). The item with the lower loading was considered less important and had little impact on the name or label selected to represent the factor (Hair et al. 1998). The last factor was named "advertisement intrusion" given that two items (i.e., being free from ads and having personal privacy violated) addressed concerns that media users can have while using interactive ads on ITV.

Factor 1 (controllable viewing) had an eigenvalue of 3.73 and explained 46.58% of the total variance. Factor 2 (multitasking) had an eigenvalue of 1.43 and explained 17.83%, and factor 3 (advertisement intrusion) had an eigenvalue of .976 and explained 12.20%. These three factors were later used as indicators of cognitive attitude in the structural equation modeling.

Two-Step Procedure of Structural Equation Modeling

My study estimated a set of structural models using LISREL 8.3. The study analyzed the hypothesized models in the following two steps. First, the study purified a measurement model by modifying the associations among measured variables of latent factors, which did not fit well in the confirmatory factor analysis model (Anderson and Gerbing 1988). Given an acceptable measurement model, the second step was to

estimate an acceptable simultaneous equation model obtained through the model purification process. Finally, the structural model was compared with the measurement model through a $\chi^2_{difference}$ test, leading to a final parsimonious model as applied to interactive television adoption.

My study first presents the analysis of the correlation matrix, which was used to estimate both the measurement and structural models. The study also introduces various statistical tests of the goodness-of-fit. Those tests and their criteria were later applied to the assessment of both the measurement and structural models.

Analysis of the Correlation Matrix

My study chose a correlation matrix as the input matrix type for the structural equation modeling. The correlation matrix was appropriate for my study because the objective of my study was only to understand the pattern of relationships between contructs, not to explain the total variance of a construct (Hair et al. 1998). The correlation matrix made it possible to make direct comparisons between the coefficients in the model by eliminating the effects due to scale differences across variables.

Before applying the correlation matrix to the structural equation model, my study attempted to purify (or screen out) observed variables to maximize their discriminant validity. The purification was done using one of two scales, i.e., (a) opinion leadership and (b) information seeking, which represent a latent variable of communication orientation. The three-item information seeking scale was not included in the correlation matrix because that scale had conceptually overlapped items with a latent variable of needs for innovativeness. In other words, because two latent variables (i.e., communication orientation and needs for innovativeness) had redundant items, they were refined for use in the structural equation model. As a result, the correlation matrix

contained 19 observed variables that represented the corresponding six latent variables (see Table 5-11, p. 125).

As shown in the correlation matrix, most of the overall correlations among the observed variables were above three. That was the minimum value required to produce the causal relationship among the observed variables (Hair et al. 1998; Kline 1998). In addition to the probability of the causal relationships, the correlation matrix provided useful information regarding the relationships between the observed variables and their latent variables.

First, the majority of correlations were high among indicators that were supposed to represent the same construct. For instance, three indicators were highly correlated with each other, in terms of perceived behavioral control. These indicators ranged from .477 to .651 and included resources (labeled "resource"), complexity (labeled "complex"), and technical matters (labeled "tecmatt").

However, three indicators of perceived functional substitution (i.e., media usage level, satisfaction with other media, and interests in ITV functions) had low correlations, ranging from .071 to -.193. To demonstrate convergent validity, these indicators that supposedly measure the same construct, (i.e., perceived functional substitution) should be at least moderately correlated (Jöreskog and Sörbom 1997; Kline 1998). Because the definition of this construct and its three-indicators were tentative and exploratory, however, the low convergent validity of these indicators was not unexpected.

The second bit of useful information in the correlation matrix revealed that an indicator of interest in ITV functions (labeled "interest") was highly correlated with a set of indicators for attitude toward ITV adoption. The correlations of interest in ITV

functions with controllable viewing (labeled "conview"), multitasking (labeled "mulitas"), and advertisement concerns (labeled "adsint") ranged from -.41 to -.61. This evidence suggested that the high correlations of a set of other explanatory variables resulted in the unstable or unreliable estimates of the model (Agresti and Finlay 1997).

The summated or averaged 19 variables were checked for their distributional characteristics, i.e., skewness and kurtosis. No variable was found to significantly violate the skewness and kurtosis assumptions, and thus all 19 variables were deemed appropriate for the structural equation modeling.

Goodness-of-Fit Index

My study utilized several goodness-of-fit indices that are usually used to test which model best fits the data (see Table 5-12). Structural equation modeling has no single statistical test that best depicts the strength of the model's fit (Hu and Bentler 1995). Rather, a number of goodness-of-fit indexes are used to assess the results of the structural equation modeling. As shown in Table 5-12, my study adopted some widely-used fit indices, based on recommendations from previous studies (Hair et al. 1998; Jöreskog and Sörbom 1997; Kline 1998).

Table 5-12. Summaries of goodness-of-fit indices

Fit Indices	Recommended value
Chi-square (χ^2)	N/A [a]
Degree of freedom (df)	N/A
Chi-square to degree of freedom ratio (χ^2/df)	≤ 3.00
Goodness-of-fit index (GFI)	≥ 0.90
Non-normed fit index (NNFI)	≥ 0.95
Comparative fit index (CFI)	≥ 0.95
Root mean square error of approximation (RMSEA)	≤ 0.05
Standardized root mean square residuals (SRMR)	≤ 0.10
Parsimonious goodness-of-fit index (PGFI)	Higher
Parsimonious normed fit index (PNFI)	Higher

[a] N/A means not applicable.

Measurement Model

The first test in the structural equation modeling involved assessing the validity of measurement models. This assessment determined whether any measurement model had an acceptable goodness-of-fit. This task was necessary prior to making any attempt to evaluate a structural model (Anderson and Gerbing 1988). In my study, the measurement models were estimated by a confirmatory factor analysis, which tested the validity of the measured variables and latent factors used in the proposed model. Table 5-13 shows a summary of models tested for my study, in terms of goodness-of-fit indices.

Table 5-13. Fit indices for Measurement Models

Fit indices	Measurement Model 1	Measurement Model 2	Measurement Model 3
Chi-square (χ^2)	369.01	295.71	258.15
Degree of freedom (df)	137	134	117
Chi-square to degree of freedom ratio (χ^2/df)	2.69	1.94	2.21
Goodness-of-fit index (GFI)	.90	.92	.92
Non-normed fit index (NNFI)	.93	.95	.95
Comparative fit index (CFI)	.94	.96	.96
Root mean square error of approximation (RMSEA)	.069	.058	.058
Standardized root mean square residuals (SRMR)	.056	.053	.049
Parsimonious goodness-of-fit index (PGFI)	.65	.65	.63
Parsimonious normed fit index (PNFI)	.73	.73	.72

As shown in Table 5-13, Measurement Model 1 (see Figure 5-1, p. 126) was unacceptable in terms of several goodness-of-fit indices, specifically its poor results on the non-normed fit index (NNFI), the comparative fit index (CFI), and the root mean square error of approximation (RMSEA). For that reason, the measurement model needed numerous modifications to improve the model fit. This rectification would be based on modification indices in LISREL 8.3, which provided diagnostic information

about how to improve the model fit and how to be calculated for parameters left out of the model (Hair et al. 1998).

Measurement Model 1 had some large modification indexes for the errors of the observed variables, specifically nd1-nd7[10] (31.51), tecmatt-complex (23.69) and nd2-nd6 (21.20). These observed variables (or indicators) may measure some common elements that are left out of a model. These common elements are called "measurement errors," which are unknown as far as the model is concerned. The measurement errors among the indicators of a single construct can covary if these indicators are all based on one method (e.g., self-report) (Kline 1998). Based on the modification indexes, the study let the errors of those variables correlate in order to improve the model fit. Modification guidelines (Kline 1998) suggested that the greater the value of a modification index, the more the overall fit of the model improves if that parameter is added to the model.

With the covariances among the errors added in the model, my study generated Measurement Model 2 (see Figure 5-2, p. 127). In this measurement model, the non-normed fit index (NNFI) was improved to .96, which was good, given the recommended value of .95 (see Table 5-13 on the previous page). The root mean square error of approximation (RMSEA) of Measurement Model 2 was .058, which now was closer to the guideline of .05. The comparative fit index (CFI) was .96, which was above a median CFI of .95, recommended by the marketing field. Therefore, this model's fit was acceptable.

The factor loading values of indicators were another matter to be considered in the modification of the confirmatory factor analysis. Measurement Model 2 had three

[10] The indicator of needs for innovativeness was labeled "nd" in my study.

indicators of perceived functional substitution [i.e., interest (.73), media usage level (-.20), and satisfaction with other media (.23)]. Two of the three indicators failed to have substantial loadings (i.e., absolute standardized value > .50) on the factor to which they were originally assigned (Kline 1998). This implied that those indicators might measure another factor.

To address this problem, Kline (1998) recommended two alternatives: (a) to respecify that an indicator could load on a different factor; or (b) to drop an indicator that is orthogonal to other indicators in the model. My study followed the latter option, that is, it deleted the media usage level indicator (labeled "usepatt") from the measurement model, because the factor loading on media usage level was in the negative direction, different from other loadings in the model. But satisfaction with other media (labeled "satisfac") remained in the model, although the satisfaction indicator did not have a substantial loading. This is because deleting the two indicators (i.e., media usage level and satisfaction with other media) required that their hypothesized assumptions be revised significantly.

After the deletion of media usage level, my study obtained Measurement Model 3 (see Figure 5-3, p. 128). The overall goodness-of-fit indices of Measurement Model 3 were similar to that of Measurement Model 2 (see Table 5-13, p. 108). Nonetheless, Measurement Model 3 made significant changes in the values of chi-square. My study found that there was a big difference in chi-square between the two models: $\chi^2_{\text{measurement model 2}} - \chi^2_{\text{measurement model 3}} = 37.56$ ($df_{\text{difference}} = 17$, $\chi^2_{.05, 17} = 27.59$). This means that the fit of Measurement Model 3 was significantly better than that of Measurement 2, in terms of goodness-of-fit.

Therefore, my study accepted Measurement Model 3 as the final measurement model in order to develop several simultaneous equation models. Figure 5-3 (see p. 128) shows the path diagram of the final measurement model, and Table 5-14 and Table 5-15 provide its structural equations.

Table 5-14. Measurement model equations for the path diagram (exogenous variables)

		Exogenous construct					
Exogenous indicator		ξ_1	ξ_2	ξ_3	ξ_4		Error
Communication orientation							
X_1	=	$\lambda_{11}\xi_1$				+	δ_1
X_2	=	$\lambda_{21}\xi_1$				+	δ_2
X_3	=	$\lambda_{31}\xi_1$				+	δ_3
Needs for innovativeness							
X_4	=		$\lambda_{42}\xi_2$			+	δ_4
X_5	=		$\lambda_{52}\xi_2$			+	δ_5
X_6	=		$\lambda_{62}\xi_2$			+	δ_6
X_7	=		$\lambda_{72}\xi_2$			+	δ_7
Perceived functional substitution							
X_8	=			$\lambda_{83}\xi_3$		+	δ_8
X_9	=			$\lambda_{93}\xi_3$		+	δ_9
Perceived behavioral control							
X_{10}	=				$\lambda_{104}\xi_4$	+	δ_{10}
X_{11}	=				$\lambda_{114}\xi_4$	+	δ_{11}
X_{12}	=				$\lambda_{124}\xi_4$	+	δ_{12}

Table 5-15. Measurement model equations for the path diagram (endogenous variables)

		Endogenous constructs			
Endogenous indicator		η_1	η_2		Error
Cognitive attitude					
Y_1	=	$\lambda_{11}\eta_1$		+	ε_1
Y_2	=	$\lambda_{21}\eta_1$		+	ε_2
Y_3	=	$\lambda_{31}\eta_1$		+	ε_3
Purchase intention					
Y_4	=		$\lambda_{42}\eta_2$	+	ε_4
Y_5	=		$\lambda_{52}\eta_2$	+	ε_5
Y_6	=		$\lambda_{62}\eta_2$	+	ε_6

Simultaneous Equation Model

The structural equation modeling combines a measurement model with a simultaneous equation model. Therefore, this structural equation model is "hybrid model," which can be seen as a synthesis of the measurement and simultaneous equation models. The simultaneous equation model was examined here on a basis of the acceptable, final measurement model, simultaneously specifying the preconceived causal relationships among the six latent variables. The specification of a hybrid model allowed tests of the hypotheses of direct and indirect causal effects (Hair et al. 1998).

After purifying the measurement model, my study fit a simultaneous equation model (i.e., Structural Model 1), which included four exogenous variables (i.e., communication orientation, needs for innovativeness, perceived functional substitution, and perceived behavioral control) and two endogenous variables (i.e., cognitive attitude and purchase intention). Figure 5-4 (see p. 129) shows the path diagram of the simultaneous equation model, and Table 5-16 provides its structural equations.

Table 5-16. Structural model equations for the path diagram

Endogenous construct		Exog.				Endo.		
		ξ_1	ξ_2	ξ_3	ξ_4	η_1	η_2	Error
η_1	=	$\gamma_{11}\xi_1$ +	$\gamma_{12}\xi_2$					+ ζ_1
η_2	=			$\gamma_{23}\xi_3$ +	$\gamma_{24}\xi_4$ +	$\beta_{21}\eta_1$		+ ζ_2

Structural Model 1 generated a good model fit overall (GFI = .90 and SRMR =.067) (see Table 5-17). Even though Structural Model 1 fit the data well, the correlated errors among the observed variables showed large standardized residuals, and were further examined in my study. In this process, large values of the modification indexes for the errors of observed variables were found. These values included interest-multitas (42.10), tecmatt-nd7 (15.72), interest-adsint (14.44), and resource-nd1 (10.98).

Table 5-17. Fit indices for Structural Models

Fit Indices	Recommended value	Structural Model 1	Structural Model 2
Chi-square (χ^2)	N/A [a]	359.30	259.03
Degree of freedom (df)	N/A	121	117
Chi-square to degree of freedom ratio (χ^2/df)	≤ 3.00	2.97	2.11
Goodness-of-fit index (GFI)	≥ 0.90	.90	.92
Non-normed fit index (NNFI)	≥ 0.95	.92	.95
Comparative fit index (CFI)	≥ 0.95	.94	.96
Root mean square error of approximation (RMSEA)	≤ 0.05	.074	.058
Standardized root mean square residuals (SRMR)	≤ 0.09	.067	.056
Parsimonious goodness-of-fit index (PGFI)	Higher	.64	.63
Parsimonious normed fit index (PNFI)	Higher	.72	.72

[a] N/A means not applicable.

Interest was conceptually defined as "positive emotion that motivates approach, exploration, and creative encounter (Izard 1977, p. 194). This definition reflects a *motivational* action tendency (Cohen 1990; Machleit et al. 1993). Empirically, interest value is sometimes used as a measure of attitude toward an object (Eagly and Chaiken 1993). In this sense, there could be a covariance between interest and cognitive attitudes that here were indicated by motivations (e.g., multitasking and advertisement intrusion). Daniel and Esser (1980) gave evidence to support the covariance between interest and motivation, i.e., the level of interest moderates the relationship between external rewards and intrinsic motivation.

The covariance between perceived behavioral control and nonevaluative consequences, such as needs for innovativeness, can be explained by the theory of planned behavior (Doll and Ajzen 1992; Madden et al. 1992). The indicators of perceived behavioral control can be correlated with the indicators for attitude toward behavior. Personal traits (e.g., the needs for innovativeness) are related to the indicators for attitude toward behavior (Ajzen and Fishbein 1980, p. 84). Thus, it was a logical

extension that the perceived behavioral control could covary with the needs for innovativeness.

Based on these theoretical backgrounds, the study tolerated the correlation of the errors of those variables (i.e., interest-multitasking/advertisement intrusion and technical matter/resources-needs for innovativeness) in the proposed model. In fact, as shown in the correlation matrix (see Table 5-11, p. 125), the motives or expected values (i.e., multitasking and advertisement intrusion) were highly correlated with interest (Pearson correlation r=-.620 and -.413, respectively). Based on the somewhat high values of the correlations, the covariance between them was an expected outcome in this model.

Structural Model 2 had increased values of the comparative fit index (CFI=.96) and the non-normed fit index (NNFI=.95) (see Table 5-17, p. 113). As well as the improved model fits, Structural Model 2 made significant changes in terms of the values of chi-square, compared to Structural Model 1. Also, Structural Model 2 had a chi-square to degree of freedom ratio of 2.11, which was less than the recommended criterion of three (Jöreskog and Sörbom 1997). All the aforementioned facts implied that Structural Model 2 fit the actual data. Thus, Structural Model 2 (see Figure 5-5, p. 130) was selected as the base model for the chi-square difference test with other competing models. This part of the analysis would generate the final structural equation model in my study.

Comparison of the Model Fits

My study utilized a chi-square difference test to examine the base model (i.e., Structural Model 2), which explicated the relationships among several constructs. As

mentioned earlier, SEM allows researchers to compare a variety of models by using a chi-square difference test.

The competing models (see Figure 5-6, p. 131) suggested that communication orientation and needs for innovativeness might have "direct" impacts on perceived functional substitution, as well as perceived behavioral control. In other words, the more frequently individuals would influence others' decisions about media services and/or take high risk with media selection, the more likely they could be to perceive interactive television (ITV) as a functional substitute for competing media. Those perceived functional substitution and perceived behavioral control, along with the attitude toward ITV purchase, in turn, would increase the probability of intent to purchase ITV in the near future. Other models of the relationships among those contructs were also plausible (see Figure 5-6, p. 131). However, my study did not obtain statistically significant results from those competing models, which otherwise could act as alternative explanations to the base model.

Finally, my study compared the base model (i.e., Structural Model 2) with the final measurement model (i.e., Measurement Model 3) through the chi-square difference test. The statistics was $\chi^2_{\text{structural model 2}} - \chi^2_{\text{measurement model 3}} = .88$ ($df_{\text{difference}}=0$). This value implied that the base model and the measurement model were virtually identical without any significant detriment of model fit. The test also revealed that the fit of Structural Model 2 was significantly improved by using theoretical considerations to specify the paths in the research model.

When my study determined which of the two models was the best final model, the parsimonious fit measures were the final set to be considered. The parsimonious

goodness-of-fit index (PGFI) and the parsimonious normed fit index (PNFI) for Structural Model 2 were .63 and .72, respectively, which were the same as those for Measurement Model 3. Nonetheless, Structural Model 2 was more parsimonious than Measurement Model 3 in terms of describing the relationships of interest, while offering the equivalent fit of the model. As a matter of fact, measurement models generally have all possible covariances among latent variables. Hence, it was here concluded that Structural Model 2 was the final structural equation model for the analysis of the data in my study. Figure 5-5 (see p. 130) presented the full path diagram of the final structural equation model.

Causal Model & Hypothesis Tests

This section discusses the examination of individual path coefficients that were derived from the causal relationships in the final structural equation model. Then, based on the final model, the hypotheses and research questions are tested.

Causal Model Analysis

My study utilized standardized path coefficients (β), which standardize path effects with absolute values. Path coefficients less than .10 amount to small effects; path coefficients around a .30 are minimum effects; and path coefficients more than .50 amount to large effects on the endogenous variable (Kline 1998). The standardized path coefficients determine the relative importance of each variable. In this sense, they help to answer the second research question: What factors have relatively strong effects on the intent to adopt an interactive television prototype?

Effects of personal characteristics: The personal characteristics variables (i.e., communication orientation and needs for innovativeness) directly and indirectly affected stages of adoption decision process (i.e., cognitive attitude and purchase

intention) (see Table 5-18).

Table 5-18. Effects of personal characteristic variables

	Communication orientation		Needs for innovativeness	
	DE [a]	(IE) [b]	DE	(IE)
Cognitive attitude	.45** [c]	-	.31**	-
Controllable viewing (conview)	.31** [d]	-	.21**	-
Multitasking (multitas)	.29**	-	.18**	-
Advertisement intrusion (adsint)	.16**	-	.11**	-
Purchase intention	-	(.30**)	-	(.20**)

[a] DE means direct effects.
[b] IE means indirect effects.
[c] Significant at the .01 level.
[d] The path coefficients were estimated with covariances among the error term generated by the corresponding latent variables.

Communication orientation had a significant direct effect on cognitive attitude (β=.45, p< .01). Specifically, the direct effects of following motives or benefits were on: (a) controlling viewing (β=.31, p< .01), (b) multitasking (β=.29, p< .01), and (c) advertisement intrusion (β=.16, p< .01). In addition, needs for innovativeness had a relatively small, direct effect on cognitive attitude (β=.31, p< .01). The needs for innovativeness directly influenced following motives: (a) controllable viewing (β=.21, p< .01), (b) multitasking (β=.18, p< .01), and (c) advertisement intrusion (β=.11, p< .01). On the other hand, communication orientation, as well as needs for innovativeness, had significant indirect effects on purchase intention (β=.30 and β=.20, respectively, p< .01).

Effects of perception variables: Stages of adoption decision process also included three perception-related variables: (a) cognitive attitude, (b) perceived functional substitution, and (c) perceived behavioral control. Cognitive attitude had a significant direct effect (β=.66, p< .01) on the intent to adopt an interactive television (ITV) prototype in the near future, as shown in Table 5-19. Perceived behavioral control had a very large effect (β=.74, p< .01) on the intent to adopt an ITV prototype in the near

future. Perceived functional substitution, however, did not significantly affect purchase intention.

Table 5-19. Effects of perception variables

	Cognitive attitude		Perceived functional substitution		Perceived behavioral control	
	DE [a]	(IE) [b]	DE	(IE)	DE	(IE)
Purchase intention	.66** [c]	-	.25	-	.74**	-

[a] DE means direct effects.
[b] IE means indirect effects.
[c] Significant at the .01 level.

Tests of Hypotheses

The significance tests for the standardized path coefficients (β) provided the basis for accepting or rejecting the hypothesized causal relationships among the latent variables in the base structural model (see Figure 5-5, p. 160). The first hypothesis (H1) proposed that users who have a more favorable attitude toward an interactive television (ITV) prototype would have higher intent to adopt ITV. The path coefficient from attitude to purchase intention was statistically significant, so H1 was supported. The second hypothesis (H2) posited that users who have a higher tendency to perceive an ITV prototype as a substitute for competing media have higher intent to adopt ITV. H2, however, was not supported because the direct path from perceived functional substitution to purchase intention was neither positive nor significant at the .05 level.

The third hypothesis (H3) proposed that users who perceive higher control over the future adoption of ITV had higher intent to adopt ITV. H3 was supported, because perceived behavioral control had a significant positive, direct effect on purchase intention. The fourth hypothesis (H4) for communication orientation suggested that users who have a higher desire to communicate with others have a more favorable attitude toward an interactive television prototype. H4 was supported. The final hypothesis (H5)

proposed that users who have a higher desire to be innovative have a more favorable attitude toward an interactive television prototype. H5 also was supported.

From the base structural model (see Figure 5-5, p. 130), my study sought to identify which of several constructs are most effective in predicting the intent to adopt ITV. Perceived behavioral control had the largest direct effect ($\beta = .74$, $p < .01$) on purchase intention. Cognitive attitude had a large direct effect ($\beta = .66$ $p < .01$) on purchase intention. In addition, "communication orientation" had a moderate large indirect effect ($\beta = .30$, $p < .01$).

The variances (i.e., squared multiple correlations comparable to R^2 in multiple regression) explained by each of the exogenous variables were respectively .46 percent for the cognitive attitude, and .69 percent for purchase intent.[11]

Differences between Adoption Intention Groups

My study used a logistic regression to determine whether differences in the indicators of perceived behavioral control and cognitive attitude toward interactive television (ITV) services could classify between potential non-innovators and innovators. The logistic regression is an alternative to discriminant analysis when the dependent variable has only two categories (Hair et al 1998). In addition, logistic regression is more robust than discriminant analysis to the variance/covariance inequalities across the groups (Hair et al. 1998).

Variables identified as significant indicators of perceived behavioral control and cognitive attitude in the final structural equation model were employed as independent variables. These included resources, complexity, technical matters, opinion leadership,

[11] The mean of R^2 for predicting intentions was .71 across studies on behavioral intention (Eagly and Chaiken 1993).

needs for innovativeness, controllable viewing, multitasking, and advertisement intrusion. The two adoption intention groups served as criterion variables in the logistic regression analysis (see Table 5-20). If respondents had below ten points after summing their scores on the three intention scales (1 = "extremely unlikely," 5 = "extremely likely"), they were treated as non-innovators; otherwise, they were classified as innovators.

Table 5-20. Adoption intention groups

Group[a]	Sum of three items (1-5 point scale)	Frequency	Percent
Non-innovator	3-9	249	75.0
Innovator	10-15	83	25.0
Total		332	100.0

[a] This grouping was adapted from a scheme of adopter categorization on the basis of innovativeness: (a) innovator (2.5%), (b) early adopters (13.5%), (c) early majority (34%), (d) late majority (34%), and (e) laggards (16%) (Rogers 1995). For instance, in my study, an innovator group (25%) may contain innovators, early adopters, and part of the early majority, based on a percentage criterion.

The discriminant function coefficients enabled the study to determine the relative importance of each independent variable in distinguishing between two groups. According to Hair et al (1998), the discriminant coefficient approach is preferable over the other approaches. In terms of discriminant coefficients, that is, indicators of discriminant power, my study found that resources as an indicator of perceived behavioral control discriminated the most (β=.53, $p< .01$) among the three independent variables in the function (see Table 5-21). Controllable viewing (β=.44, $p< .01$) as an indicator of cognitive attitude followed, and technical matters (β=.41, $p< .01$) as an indicator of perceived behavioral control discriminated the least.

Table 5-21. Discriminant function coefficients

Variable (name)	Discriminant coefficient
Resources (resource)	.53**
Controllable viewing (conview)	.44**
Technical matters (tecmatte)	.41**

** Significant at the .01 level.

The perceived difficulties (e.g., affordability and connectivity) in purchasing ITV in the near future discriminated strongly between non-innovators and innovators. Those who had more control over price or service connection were more likely to be classified as the innovation group. In addition, the level of the individual's expectations of controllable viewing also distinguished innovators from non-innovators. In other words, those who had higher expectation about ITV's controllable functions were more likely to belong to the innovator group.

As a result, innovators are more likely to control monetary and technical difficulties about ITV and to seek controllable ITV viewing functions. Table 5-22 contains the results for the logistic regression analysis, using a stepwise forward selection method.

Table 5-22. Classification with two groups with stepwise forward method [a]

		Predicted		
	Observed	Group 1	Group 2	Percentage correctly classified (t-value, df=330)
Step1	Non-innovator group 1	228	21	91.4%
	Innovator group 2	52	31	37.3%
	Overall percentage			78.0% (.78**)
Step2	Non-innovator group 1	228	21	91.4%
	Innovator group 2	40	43	51.7%
	Overall percentage			81.5% (.88**)
Step3	Non-innovator group 1	229	20	91.9%
	Innovator group 2	40	43	51.7%
	Overall percentage			81.5% (.88**)

[a] The cut-off value is .5.
** Significant at the .01 level.

In the final step, 81.5% of cases in the analysis were correctly classified. That percentage was somewhat high so that the study could judge the aforementioned discriminant function (see Table 5-21 on the previous page) to be accurate in discriminating between two groups. To verify that percentage (i.e., 81.5%) in

mathematics, the study compared it with the proportional chance criterion (Hair et al. 1998). The calculated value is .625; that is, 62.5% of cases could be correctly classified without using the discriminant function. The classification accuracy of 81.5% was significantly higher than the proportional chance criterion of 62.5%. Therefore, the function was accurate in classifying between the two intention groups.

Demographic and Socioeconomic Characteristics of Adoption Intention Groups

Differences in demographic and socioeconomic characteristics among adoption intention groups were also examined to discern if there were distinct profiles on these characteristics for each group. Generally, innovators were younger and higher educated (Li 2001). As for family size, innovators lived with the fewer family members (Lin 2000). Inconsistent with previous studies, the two groups in my study were not significantly different in their age, education, and family size, as shown in Table 5-23.

Table 5-23. T-test for the means of adoption intention of the two groups' demographic and socioeconomic characteristics

Variable	Adoption intention group		t-value (df=330)
	Non-innovator (n=249)	Innovator (n=83)	
Age	3.90	3.84	-.31
Education	2.82	2.84	.16
Family size	3.26	3.26	.00
Income	5.24	5.81	2.15*

* Significant at the .05 level.

Results of t- tests, as shown in Table 5-23, indicated that the levels of annual household income for innovators were significantly higher ($p < .05$) than those for non-innovators. Innovators' annual household income skewed toward the "above $90,000" category, similar to that of non-innovators (see Table 5-24 on the next page). However, the proportion of innovators earning incomes from $75,000 to above $90,000 was higher (68.96% of total innovators) than one of non-innovators earning the same range of

incomes (56.32% of total non-innovators). This provided evidence that the household income of the innovator group was higher, compared with that of the non-innovator group.

Table 5-24. Annual household income by adoption intention group

Income	Adoption intention group		N=332
	Non-innovator (n=249)	Innovator (n=83)	%of total
Under $15,000	14 (4.3%)	3 (.9%)	17 (5.2%)
$15,000-$29,999	17 (5.2%)	0 (0%)	17 (5.2%)
$30,000-$44,999	19 (5.6%)	9 (2.6%)	28 (8.2%)
$45,000-$59,999	36 (10.8%)	7 (2.2%)	43 (12.9%)
$60,000-$74,999	23 (6.9%)	7 (2.2%)	30 (9.1%)
$75,000-$89,999	38 (11.6%)	11 (3.4%)	49 (15.1%)
Above $90,000	102 (30.6%)	46 (13.8%)	148 (44.4%)

There was no statistically significant difference between adoption intention groups in terms of their occupation, although distributions among blue- and white-collar occupations were not similar for innovators and non-innovators. Table 5-25 indicates the frequency and percent comparisons of the two groups for each of the demographic and socioeconomic characteristics.

Table 5-25. Demographics and socioeconomics by adoption intention group

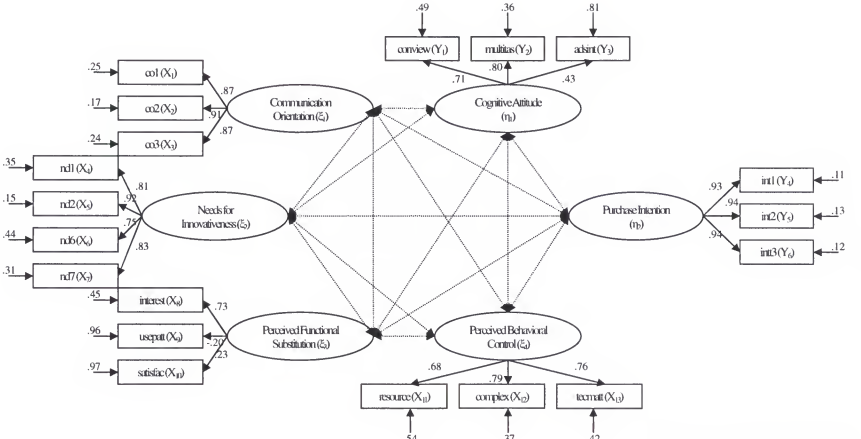
Age	Adoption intention group		N=332
	Non-innovator (n=249)	Innovator (n=83)	(%of Total)
18-24	26 (7.8%)	6 (1.8%)	32 (9.6%)
25-34	67 (20.3%)	31 (9.1%)	98 (29.3%)
35-44	80 (24.1%)	20 (6.0%)	100 (30.2%)
45-54	60 (18.1%)	22 (6.9%)	82 (25.0%)
55 or more	16 (4.7%)	4 (1.3%)	20 (6.0%)
Education	Adoption intention group		N=332
	Non-innovator (n=249)	Innovator (n=83)	(%of Total)
Post graduate	32 (9.5%)	16 (4.7%)	48 (14.2%)
Master's degree	57 (17.2%)	17(5.2%)	74 (22.4%)
Bachelor's degree	100 (30.2%)	27 (8.2%)	127 (38.4%)
Attended/attending college	52 (15.5%)	15 (4.3%)	67 (19.8%)
Graduated high school or less	8 (2.5%)	8 (2.5%)	16 (5.0%)
	Adoption intention group		

Family size (Number of family members)	Non-innovator (n=249)	Innovator (n=83)	N=332 (%of Total)
1	26 (7.8%)	6 (1.7%)	32 (9.5%)
2	59 (17.7%)	26 (7.8%)	85 (25.4%)
3	46 (13.8%)	11 (3.4%)	57 (17.2%)
4	77 (23.3%)	26 (7.8%)	103 (31.0%)
5	33 (9.9%)	10 (3.0%)	43 (12.9%)
6 or more	8 (2.5%)	4 (1.3%)	12 (3.8%)

Occupation	Adoption intention group		N=331 (%of Total)
	Non-innovator (n=249)	Innovator (n=82)	
Managers/businesses/sales	44 (13.4%)	27 (7.8%)	71 (21.2%)
Professional	89 (26.8%)	31 (9.5%)	120 (36.4%)
Homemaker	27 (8.2%)	7 (2.2%)	34 (10.4%)
Cashier/customer service	4 (1.3%)	0 (0%)	4 (1.3%)
Clerical/administrator	12 (3.5%)	1 (.4%)	13 (3.9%)
Engineers/technician	13(3.9%)	7 (2.2%)	20 (6.1%)
Others (including students)	60 (18.2%)	9 (2.6%)	69 (20.8%)

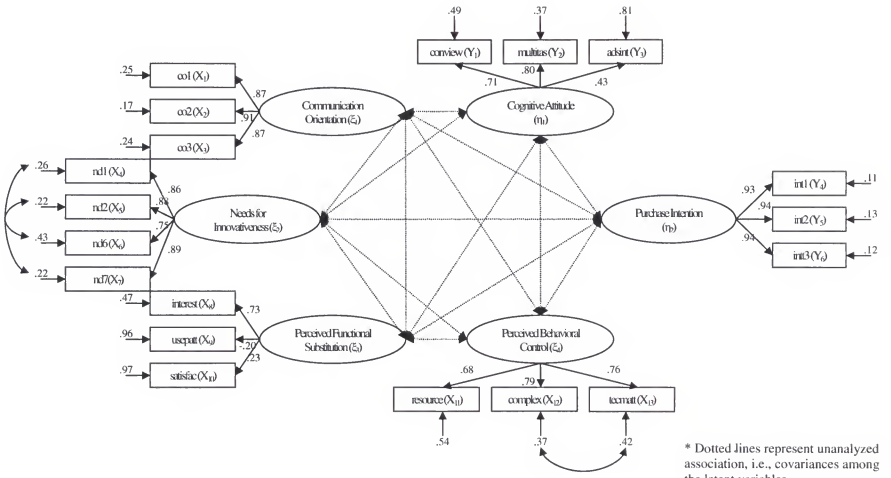
Table 5-11. Correlation matrix

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. co1	1																		
2. co2	.792	1																	
3. co3	.747	.793	1																
4. nd1	.426	.445	.488	1															
5. nd2	.450	.467	.502	.765	1														
6. nd6	.354	.386	.371	.626	.658	1													
7. nd7	.476	.485	.466	.594	.775	.689	1												
8. interest	-.345	-.370	-.351	-.376	-.356	-.332	-.293	1											
9. usepatt	.211	.229	.105	.144	.216	.117	.203	-.193	1										
10. satisfac	-.241	-.267	-.184	-.123	-.124	-.144	-.152	.071	.091	1									
11. resource	.313	.286	.312	.349	.303	.225	.230	-.298	.084	-.260	1								
12. complex	.373	.333	.367	.204	.329	.249	.281	-.256	.051	-.274	.508	1							
13. tecmatt	.240	.255	.276	.215	.284	.245	.155	-.309	.058	-.195	.477	.651	1						
14. conview	.416	.427	.408	.397	.353	.390	.361	-.500	.127	-.108	.269	.203	.230	1					
15. multitas	.330	.311	.361	.330	.323	.235	.270	-.620	.105	-.026	.242	.239	.268	.582	1				
16. adsint	.207	.238	.178	.241	.255	.260	.246	-.413	.075	-.131	.161	.127	.182	.265	.339	1			
17. int1	.372	.398	.371	.380	.346	.294	.285	-.561	.096	-.192	.516	.409	.421	.498	.579	.287	1		
18. Int2	.403	.390	.353	.396	.361	.281	.260	-.501	.124	-.251	.532	.429	.437	.482	.534	.252	.875	1	
19. int3	.420	.420	.395	.382	.388	.304	.315	-.511	.137	-.181	.546	.452	.468	.472	.571	.213	.874	.882	1
SD	1.12	1.16	1.17	.85	.93	.82	.90	.65	.49	.60	7.76	.7.59	6.37	4.94	4.60	6.59	1.06	1.14	1.12



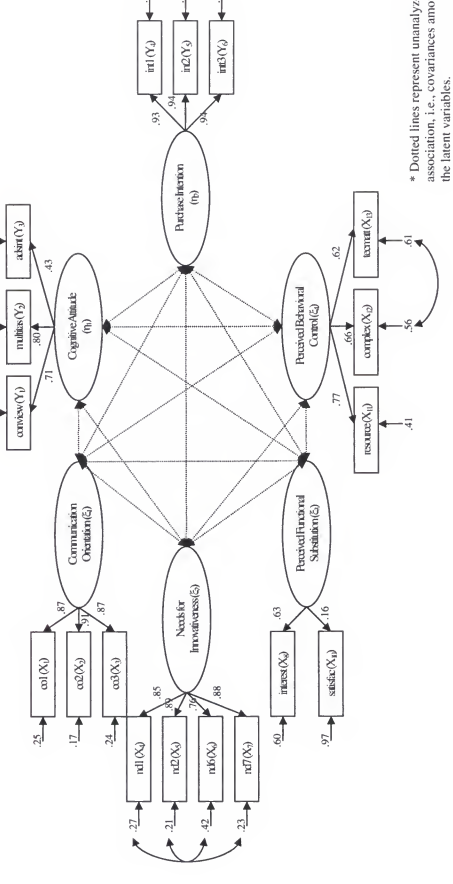
* Dotted lines represent unanalyzed association, i.e., covariances among the latent variables.

Figure 5-1. Measurement Model 1



* Dotted lines represent unanalyzed association, i.e., covariances among the latent variables.

Figure 5-2. Measurement Model 2



* Dotted lines represent unanalyzed association, i.e., covariances among the latent variables.

Figure 5-3. Measurement Model 3: A final measurement model

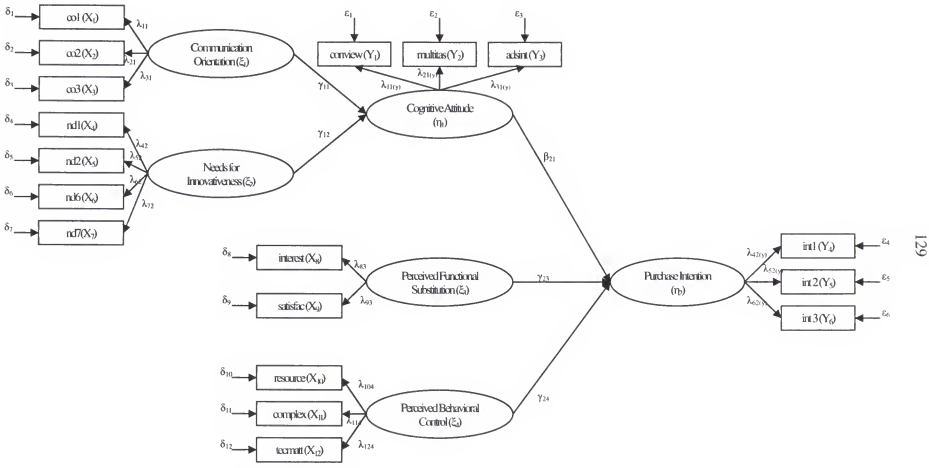


Figure 5-4. A path diagram of a simultaneous equation model

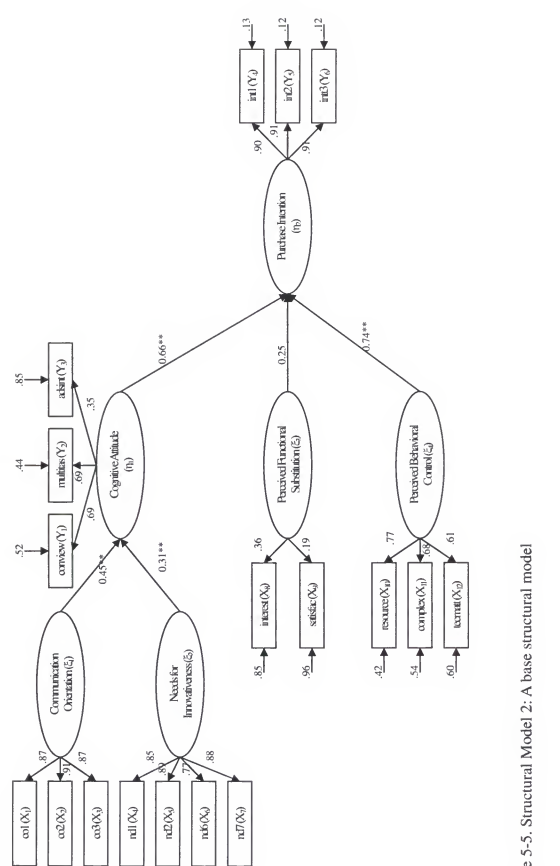


Figure 5-5. Structural Model 2: A base structural model

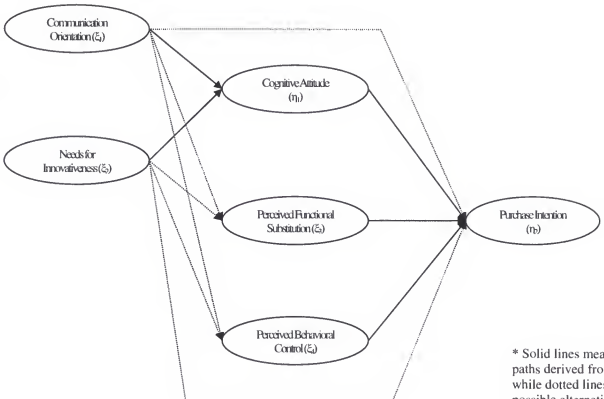

Communication Orientation (ξ_1)
Needs for Innovativeness (ξ_2)
Cognitive Attitude (η_1)
Perceived Functional Substitution (ξ_3)
Perceived Behavioral Control (ξ_4)
Purchase Intention (η_2)
* Solid lines mean the hypothesized paths derived from the research model, while dotted lines represent all possible alternative paths among the latent variables.

Figure 5-6. Other Competing Models

CHAPTER 6
DISCUSSION AND IMPLICATION

This chapter discusses the results of the test for several hypotheses and research questions, in terms of the contribution of each variable to the adoption of an interactive television prototype. From the findings, practical and theoretical implications are presented, together with the limitations of my study and suggestions for future research.

Summary of Findings

The summary is centered on the key questions that were raised in the first chapter. The answers to these questions are based on the findings obtained through the examination of the hypotheses and research questions.

Motives

A key question that my study raised was with regard to media users' motives in adopting an interactive television (ITV) prototype. The motives have been treated as one of the main components of adoption behavior (Reagan 1996).

> What are consumers' or media users' motives to adopt or use an interactive television prototype?

The study found three primary motives for ITV adoption: (a) controllable viewing, (b) multitasking, and (c) advertisement intrusion. Those motives (or benefits provided by the future ITV) were significant predictors for the intention to purchase or to use ITV in the near future.

Among those motives, controllable viewing (e.g., adjusting television programs in an easier or simpler way to instantly record, replay, fast-forward, and rewind them) most strongly influenced the adoption of ITV. Multitasking (e.g., watching television and surfing the Internet simultaneously or communicating with neighbors while watching television) also strongly affected the intent to adopt ITV. Despite high interests in skipping commercials in ITV, advertisement intrusion (e.g., escaping from ads) had a small effect on the attitude toward ITV adoption behavior, and further, a relatively little effect on the intent to adopt ITV.

Preferences

A key question of my study centered on consumers' preferences for interactive television (ITV) services. Identifying and understanding media user preferences or interests are critical pursuits of profitable business opportunities (Bearden et al. 2003). Based on the preferences for (or interests in) ITV functions, ITV-associated companies can make various efforts to develop new functions and to evaluate the marketability of various service models.

> What are consumer preferences for interactive television (ITV) applications or services? Which ITV applications are most sought by consumers?

My study found that most media users (strictly speaking, Internet users) expressed moderate concerns and interests in ITV functions. Among several functions, individuals were mostly interested in the personal video recorder (PVR) functions (e.g., skipping commercials and pausing or recording live TV in an easier way), followed by video-on-demand and the Internet functions on TV.

However, a majority of media users gave lower ratings to some of the advanced ITV functions that most closely resemble a package of "prototype" ITV services. These functions include non-program-related enhanced features (such as multiplayer video game, chatting, taking polls/voting and so on) and program-related features (e.g., interactive game shows). Media users were more interested in the program-related "interactive services," rather than "Internet services" (see Figure 1-1, p. 4).

Functional Substitution

A key question of my study concerned how much interactive television (ITV) was perceived to be a substitute for other competing media and whether the perception of functional substitution would play a significantly great role as a predictor of the intention to adopt ITV. Perceptions of functional substitution can determine which media are considered proper to particular functions, thus leading to the choice of that medium (Sitkin et al. 1992)

> Is an interactive television (ITV) prototype perceived to be a substitute for other competing media or a supplement for them? And how is the perceived functional substitution related to intent to adopt ITV?

The study found that ITV was perceived as a substitute for existing television services (median=4, SD=.76) and videocassette recorders (median=4, SD=.79); however, regarding the Internet, ITV was perceived more as a supplement (median=2, SD=.62; 1=extremely supplementary, 5=extremely substitutable). Media users thought that the Internet would not to be replaced with the future ITV. It may be inferred that ITV could be a continuous type of traditional television but could supplement "tasking" functions (e.g., actively seeking information) of the Internet.

In the bivariate analysis of my study, media usage level, along with satisfaction with other media, were negatively related to the perceived functional substitution of ITV for other competing media. Specifically, the less time media users spent using VCRs, and the less satisfied they were with VCRs, the more likely they were to perceive ITV as a substitute for VCRs. In addition, the interest in ITV functions was highly correlated with the perceptions of ITV's functional substitutions for competing media. The perceived functional substitution, however, did not affect the intent to adopt ITV, unlike what the study anticipated.

Influential Factors

A key question asked which factors differentiate potential adopters (i.e., innovators) on intent to adopt an interactive television (ITV) prototype. Those factors can help ITV-associated firms to reach market segments and to estimate the potential of target markets (Bearden et al. 2003).

> Which factors differentiate potential subjects on intent to adopt an interactive television prototype?

An individual's perception about his or her available resources for purchasing or using ITV in the near future discriminated most strongly between potential non-innovators and innovators. For instance, innovators tend to have much more control of their resources than non-innovators, in terms of the expected cost or intrinsic value of ITV (e.g., ITV would be worth extra money). The motives or benefits derived from "controllable viewing" were also influential in differentiating innovators from non-adopters on their intention to adopt ITV.

The level of control over the technical difficulties associated with ITV was somewhat useful in classifying between potential innovators and non-innovators. In other words, innovators are more likely to control over those ITV technical difficulties. These difficulties might be incurred both by complexities of ITV functions and a slow speed of connection to end users. Finally, the level of annual household income ($t=2.15$, $p< .05$) was an indicator of the intention to adopt ITV, based on the results of a t-test in my study.

Discussion

This section discusses the findings of my study in comparison with some primary variables other previous studies have utilized. The aforementioned variables can be summarized according to the following four categories: (a) demographics, (b) other media use, (c) personal perceptions, and (d) technical/social/corporate factors (see Table 2-1, p. 44-51).

Those tables show several factors that explain each of the categories associated with the adoption and use of innovations. The first category lists the demographics of media users, which are their income, education, family size, and age. The second category has the usage levels of other media, in terms of time spent using those media and the level of the satisfaction with those media. The third category includes personal perceptions about an innovation. The last category is composed of technical features of an innovation and the social settings or circumstances in which adoption of an innovation occurs, including corporate factors such as price, service coverage, and so on. The following paragraphs explain those four categories in more detail.

Demographics

Demographic findings vary from study to study (see Table 2-1, p. 44-51). For instance, early adopters of innovations were thought to be more upscale and better-educated than non-adopters. This stems from the assumption that income is necessary in overcoming cost barriers to such innovation purchases, while education could make one more aware of adoption benefits (Atkin 1993). However, several findings are inconsistent with that general assumption. LaRose and Atkin (1988b) found that income and education were not predictors of cable television adoption. Regarding the adoption of high-definition (HD) television, Dupagne (1999) contended that the level of household income and education did not necessarily affect the adoption of HD television.

According to other innovation adoption literature (Atkin 1993; Rogers 1995), when new technologies have not reached critical mass in their diffusion curves, demographic variables play significant roles in differentiating adopters from non-adopters. Interactive television (ITV) services are at the nascent stage in the U.S. market, so my study anticipated that demographic variables, especially income and education, should have powerful effects on the adoption of these services.

My study found that most of the demographic variables were not related to the adoption of ITV. The potential innovators were not found here younger, better-educated media users. These findings were inconsistent with ones of other previous studies (Li 2001; Lin 2001; Zhu and He 2002). My study examined a future product (i.e., prototype) while other previous studies examined innovations (e.g., the Internet) that had reached the mass. Furthermore, my study selected Internet users in the U.S. as a sampling frame, while those previous studies selected general populations in various countries as

sampling frames. These facts might cause the findings of my study to be inconsistent with ones of other previous studies.

Only the annual household income was effective in differentiating innovators from non-innovators. The finding leads my study to conclude that most low-income media users in the U.S. might regard ITV services as so expensive that they could not afford them and further do not intend to pay for these ITV services. In other words, this affordability plays a critical role in separating innovators from non-innovators. However, the fact is difficult to generalize due to the non-representative nature of the samples, in terms of income status (see Table 5-2, p. 90).

Other Media Use

Five categories of media usage level were investigated. These categories included television services (cable/satellite/others), the Internet, videocassette recorders (VCRs), digital video disc players, and video game consoles. They were each treated here as a medium competing with interactive television (ITV) services.

According to previous studies (see Table 2-1, p. 44-51), other media usage levels play a significant role when a technology has not reached its critical mass (Li 2001). My study anticipated that the media usage levels would significantly affect the intention to adopt interactive television (ITV) services because ITV was at the nascent phase in the U.S. Furthermore, the other media (i.e., television service, the Internet, VCRs, DVDs, and game consoles) bear functional similarities with ITV, which allows media users to explore a wider range of options for viewing time and content (Atkin 1993). For example, VCRs are similar to ITV's personal video recorders (PVRs) service in that both allow for storage and replay of programs. It was, thus, likely that the media use levels

would be negatively related to the adoption of ITV services if a conception of functional similarity was verified.

According to the results of bivariate analyses, as my study expected, VCR and Internet usage levels, along with satisfaction with VCRs and game consoles, were negatively related to the perception of ITV's functional substitution for each of these two media. My study, however, failed to reveal that other media use (i.e., usage level and satisfaction) would have significant impacts on the intent to adopt ITV services. For this regard, this finding could challenge the assertion that heavy users of other media might be more likely to adopt new multimedia applications (Jeffres and Atkin 1996).

Personal Perceptions

Motives: Cognitive attitudes (i.e., motivations) toward communication technologies have explained why individuals adopt them for some instrumental reasons (LaRose and Atkin 1988a; 1988b; 1991). The uses and gratifications perspective contends that individuals have motivations (or gratification sought) that will encourage "reasoned" activities (Dutton et al. 1987). My study provided evidence to support this assertion. My study found that the expected benefits for using interactive television (ITV) services would influence the intent to adopt ITV services. In other words, individuals' cognitive attitude toward ITV adoption behavior contributed highly to their determination of intent to adopt ITV. This finding is consistent with the previous studies of media adoption (Ferguson and Perse 2001; LaRose and Atkin 1991; Leung and Wei 1999; Lin 2001; 1999).

Perceived functional substitution: A functional similarity principle is composed of two primary concepts: (a) functional substitution and (b) relative advantage. This principle posits that if a new medium is perceived as being able to satisfy the same needs

fulfilled by old media "more effectively," it will "substitute" the old. In other words, the old medium will be *functionally substituted* by a new medium that has *relative advantages* over the old medium. Previous studies found that the relative advantages of innovations had positive impacts on the adoption of innovations (Eastlick 1996; Li 2001; Ledingham 1984; Lin 1998; Rothe et al. 1983; Sparkers and Kang 1986; Zhu and He 2002). In addition, Flamagin and Metzger (2001) found that there were functional similarities between the computer and other communication media (e.g., telephones, televisions, newspapers, and magazines). Lin (1999) contended that television and online services would be similar to each other, in terms of both technological and content dimensions.

In my study, relative advantages of interactive television (ITV; e.g., watching more shows that fit viewer's tastes and saving time by doing several things at once) were found to be a significant predictor of ITV adoption. ITV services were also perceived as a substitute for existing television services and videocassette recorders. My study, however, found that an individual's perception of ITV's substitution for those media did not significantly affect the intent to adopt ITV. This finding implied that behavioral intention might be difficult for experience goods (e.g., media services) in a prototype situation. The evidence, thus, partially rejected the functional similarity principle, i.e., although ITV was perceived as a substitute for some other media, the perceived functional substitution did not influence the intention to adopt ITV services. The evidence also suggested that the principle would be difficult to verify by applying a simple concept of perceived functional substitution as an indicator or cause of the intent to adopt an innovation.

Communication orientation: According to previous studies (Jeffres and Atkin 1996; Rafaeli and LaRose 1993), communication orientation is positively related to the adoption of an innovation. Similarly, my study found that individuals' characteristics (such as the predisposition in communicating with others) had a strong direct impact on the attitude toward ITV adoption, and furthermore a strong indirect impact on their intent to adopt ITV. The possible explanation for this finding was that individuals' tendencies to communicate with others (i.e., to give them a piece of advice about their innovation adoption) heavily influenced the likelihood of ITV adoption. This finding, however, contradicted a previous study suggesting that communication-associated variables were not compelling evidence in adopting an innovation (Atkin et al. 1998).

Needs for innovativeness: Previous studies (Jeffres and Atkin 1996; Lin 1998; Rogers 1995) suggested that needs for innovativeness might be an important predictor of the adoption of innovations. Like those studies, my study found that the needs for innovativeness significantly affected the attitude toward ITV service adoption, as well as the intent to adopt ITV services. In addition, positive orientation toward technological innovativeness was found here as one of the variables of differentiation for ITV adoption groups.

Interests: Previous studies found that adopters had greater interest in communication technology than did non-adopters (Ferguson and Perse 2001; Garramone et al. 1986; Lin 1999; 2001). In my study, media users' interest in ITV functions was somewhat high, although the users were somewhat influenced by their existing levels of awareness about ITV. From this finding, it may be inferred that media users' interest in

the advanced ITV functions could be just an outcome that occurred after media users became aware of a non-existing product, i.e., an ITV prototype.

Technical/Social/Corporate Factors

Technical, social, and corporate factors (e.g., off-air-reception, computer connectivity, and price or cost) have been treated as key determinants of technology adoption behavior (LaRose and Atkin 1988b; Perse and Dunn 1998; Reagan 2002). For instance, Perse and Dunn (1998) found that home computer connectivity (e.g., modem ownership, online service subscription, and Internet access) influenced consumers' using computers for entertainment and passing time. Lin (1998) found that likely adopters perceived themselves to have more available resources than non-adopters, when these adopters considered their perception of the product's intrinsic value. A concept of perceived behavioral control was treated here as one of social factors although it is a personal perception. The reason for this is that the perceived behavioral control was closely related to price or cost as a corporate factor and connectivity as a social factor.

My study found that media users' perceptions of how much control they would have in adopting interactive television (ITV) had the strongest effect on the intent to adopt ITV. This fact implies that media users were concerned about their resources (i.e., affordability and intrinsic value) and technical difficulties (e.g., slow connection speed) that might be incurred if they would purchase or use ITV services in the near future. Especially, resources were the key determinant of the intent to adopt ITV. Based on the present data, the intention rate of ITV adoption was first and foremost predicted by resources. This finding was consistent with previous studies (Perse and Dunn 1998; Lin 1998).

Practical Implications

With the rapid expansion of digital satellite providers, the competition for media users has become fierce. Thus far, interactive television (ITV) content or service providers (including cable or satellite service providers) have resisted investing substantial amounts of money on the deployment of enhanced interactive applications or content, due to the lack of long-term profitability of existing ITV services. In fact, forecasts for the success of video-on-demand (VOD) and personal video recorders (PVRs) as interactive television (ITV) applications appeared gloomy, owing to their limitations as a revenue model. Thus, it is reasonable for ITV providers to prepare new ITV services for long-term revenue growth in the ITV industry.

A key question of my study was with regard to "new" killer applications or services for ITV. By addressing this question, my study can render some beneficial implications for ITV-associated firms (especially cable operators and advertisers), who were using or contemplating such new, enhanced interactive applications.

> Which current and planned interactive television (ITV) applications can provide the greatest opportunity for an increase of ITV subscribers? And how should cable operators and ITV content providers position themselves for a successful rollout of newer ITV applications?

The Internet Model

My study offered a basis of simultaneously understanding consumers' 'actual' motives for, and their interests in, an interactive television (ITV) prototype. In my study, motives to use an ITV prototype had an overall average mean of 3.3, while interests in ITV functions had an overall average mean of 3.1 in the 1-5 scale. In more detail, media

users had somewhat high motives to do multitasking (e.g., surfing the Internet) while watching television. The multitasking motives (e.g., watching television while getting on the Web) had an average mean of 3.02. Despite such high motives, media users were relatively less interested in Internet functions. The interests in Internet functions had an average mean of 2.67.

The gap between an individual's actual motives to use ITV and his or her interests in ITV functions might be caused by a likelihood that the motives reflect the future adoption of ITV applications, while the interests reflect the present situation (e.g., TiVo or ReplayTV are currently available in the market). In this sense, an individual's motives are treated here as a barometer of his or her future behavior or adoption, and motives are given priority over the interests in ITV functions. Thus, based on consumers' motives, my study attempts to determine which ITV model can be profitable in the long term.

In my study, media users had their motives for multitasking that significantly affected their intents to adopt ITV. This finding was evidence to support that there exist consumers' actual motives or needs for multitasking functions of ITV.

Based on this finding, my study presents the following implication:

> The multitasking motive (e.g., viewing television programs and surfing on the Web at the same time) was found to affect the intent to adopt ITV, and this finding leads my study to conclude that one profitable service model can be the "Internet model."

As mentioned earlier, there are three service models, each of which has some unique ITV services or applications (see Figure 2-1, p. 18). First, the personal video recorder (PVR) model (e.g., TiVo and ReplayTV) has applications that allow viewers to

digitally record video content; to pause, rewind, and impose slow motion on live television; to record favorite shows easily; to skip commercials; and to find programs via an interactive program guide (IPG) easily.

Second, in the multiple system operators (MSO) model, two-way communications and the ability to manipulate the information on a viewer's television screen are delivered to digital set-top boxes via a cable or satellite provider.

Third, in the Internet model, television programs or content can be delivered via the Internet. This model included the PVR and MSO model capabilities, as well as other functions, such as the ability to surf the Web, play real-time multiplayer games, and chat with other viewers. This latter model appears close to an ITV prototype, since that model contains Internet services, as well as interactive services (e.g., personal video recorders and video-on-demand).

In fact, WebTV and EnhancedTV, as initial ITV trials of the Internet model, were unsuccessful in convincing consumers to purchase or use ITV, due to their technical difficulties (e.g., slow connectivity). Currently, the technical challenges have been, to some extent, addressed by broadband-conduits and newly devised set-top boxes. My study, hence, suggests that it could be time to prepare to deploy the Internet service model in the U.S. market. The Internet model might be a way for cable operators to compete against their competitors (e.g., satellite service providers) and differentiate themselves in a crowded marketplace.

Packaging & Killer Applications

Another useful contribution of my study is to address the issue of packaging regarding other-media-associated functions that would be plausible or applicable to

interactive television (ITV). For instance, the study can lay "a sounder basis for assembling innovations in easier-to-adopt packages (Rogers 1995, p. 236)," which could help ITV service providers to make choices about future applications or content in an informed manner.

As mentioned earlier, media users' motives for more controllable viewing and multitasking on TV directly affected the intent to adopt ITV. For instance, while watching TV programs, media users are motivated to get on the Web for information about the programs (i.e., Internet access) and to use other non-program-related enhanced features (t-commerce, chatting while playing multiple video games, etc.).

On the other hand, while ITV was perceived as a substitute for existing television services and videocassette recorders (VCRs), it was not perceived as a substitute for the Internet. This implies that ITV could be perceived as a "discontinuous innovation" (Krugman 1985) that could have a dramatically strong impact on current television service subscription and VCR usage. However, regarding the Internet, ITV was not perceived as a substitute for the Internet. From this finding, my study could infer that media users perceived ITV as an "evolutional," non-revolutionary, innovation derived from the Internet. In this sense, ITV's Internet functions could stimulate or encourage media users to use ITV and to reinforce the legitimacy of media user's ITV choice.

Based on these findings, my study offers the following implication:

> Media users' (a) actual desires or needs for non-program-related ITV functions (e.g., multitasking) and (b) perceptions of ITV as a non-substitute to the Internet lead my study to suggest that PVRs or VOD services currently offered by cable or satellite service providers should be packaged with Internet access, as a possibly profitable combination of ITV.

When cable operators or ITV content distributors approach how to package killer ITV applications, those firms should consider both the current and future levels of technology. For awhile, PVRs and VOD might remain killer applications for an ITV prototype because they naturally lend themselves to current levels of multimedia technology. In the near future, new set-top boxes or new technologies will emerge in the market. Those boxes can allow for non-program-related enhanced features (e.g., Internet access, t-commerce, chatting while playing multiple video games, etc.). Given this future level of technology, my study suggests the plausibility of enhanced TV features via the Internet as a new killer application for long-term ITV growth.

Resources

It is very important to consider that the most influential factor among determinants in adopting an interactive television (ITV) prototype was resources (i.e., affordability and intrinsic value) for ITV purchase. In other words, the key determinant of successful ITV diffusion was resources. Regardless of how appealing ITV attributes are to consumers or how widely available ITV programming is, if retail prices of ITV set-top boxes and its services are high, consumers will be less likely to adopt ITV. In addition, unless consumers or media users perceive these features to be worth extra money, enhanced ITV features will remain imaginary concerns for consumers. Considering the "resources" concern, my study offers the following implication:

> ITV content providers or distributors should convince consumers that advanced ITV features can provide some added benefits beyond the simple combination of existing television and Internet services, so it is worthwhile to spend extra money.

More specifically, my study suggests that ITV-associated firms will have to devise pull-promotion strategies that stimulate interest and demand at the end-user level (Dupagne 1999). One of the strategies can be to target potential early adopters as a consumer segment with advertising messages that should tout ITV's relative advantages, such as availability of multitasking on TV, skipping commercials, and so on.

Opinion Leaders as Early Adopters

ITV adoption is expected to follow an S-curve. The number of users will grow slowly at first during the launch, increase rapidly as positive feedback and network externalities[12] kick in, and then taper off as the market nears saturation (Adams et al. 2002). ITV is now at the nascent phase of the adoption curve. At that phase, ITV needs initial roll-out and awareness campaigns. To implement those campaigns, the profiling of opinion leaders[13] is very important because they are most influential in igniting the diffusion of a new product (Chan and Misra 1990; Rogers 1995). ITV service providers, thus, should attempt first to identify who are opinion leaders, which ultimately would lead to an increase of the diffusion rate of ITV.

The profiling of opinion leaders has come under much debate. The possible characteristics of opinion leaders have been innovativeness, age, income, education level, etc. (Chan and Misra 1990). In my study, derived from the results of an independent samples t-test, opinion leaders were found to be characteristic of higher innovativeness ($t=-8.446$, $p< .000$), older age (more than 35 year old; $t=3.536$, $p< .000$) and higher annual income (more than $60,000; $t=-2.057$, $p< .05$). In addition, opinion leaders were

[12] Network externalities mean that the utility from using a good increases when other individuals use the good (Page and Lopatka 2003). As fax machines increase in popularity, for example, a fax machine becomes increasingly valuable since others will have greater use for it.

[13] Opinion leaders can be defined as "individuals are able to informally influence other individual attitudes or overt behavior in a desired way with relative frequency" (Rogers and Kincaid 1981).

found to fall into an innovator group, including early adopters ($t=-4.870$, $p< .000$). In fact, opinion leaders have often been categorized as early adopters (Rogers and Cartano 1962; Rogers 1995). As a result, my study profiled opinion leaders as innovative, older, higher-income, and early adopters. Based on these findings, my study suggests the following implication:

> ITV service providers should target-advertise or promote ITV services to opinion leaders who are characterized as innovative, older, and high annual income people.

If the targeted ads or promotions are effective as ITV initial awareness campaigns, opinion leaders can have their positive perceptions about (or attitudes toward) ITV adoption, which may lead to purchasing or using ITV. Those opinion leaders as early adopters, in turn, gradually convince individuals in a social system (i.e., interpersonal network) to adopt ITV through word-of-mouth. Thus, based on the profile of opinion leaders, targeting opinion leaders in advertising or promoting ITV can allow for an increase in the diffusion rate of ITV.

Interactive Advertisements on ITV

My study can guide advertisers to understand the attractiveness and potential of current and planned ITV applications. At this time, ITV might provide a double-edged sword for advertisers, not only facilitating exposure to more targeted media users, but also allowing more avenues for "avoidance." Thus, if advertisers are to cope with such challenging situations effectively, they must understand how media users will adopt ITV's enhanced features.

The study found that media users were highly interested in ITV's "skipping commercials" function. The high interest was significantly correlated with the perception that ITV would replace other competing media such as current television, videocassette recorders, and game consoles. Media users' motives for "avoiding advertisements and having privacy protected," on the other hand, had a somewhat moderate impact on the intention to adopt ITV in the near future. In other words, the higher desires people have to avoid traditional ads on TV and to protect their own information from interactive ads on ITV, the more likely they are to purchase the ITV services in the near future. Based on these findings, my study suggests the following implication to advertisers:

> Regarding ITV advertisements, media users (a) had high interests in "skipping commercials" and (b) moderate motives about privacy protection on interactive ads that was directly related to increased adoption. Thus, my study suggests that media users may react to ITV advertisements in two ways: (a) aggressively escaping from one-way traditional ads on ITV and (b) paying more attention to two-way interactive, customized information about products/services in ads or programs if media users' private information can be protected from commercial uses.

Traditionally, from the consumer level, television advertisements have played two significant roles in television viewing: (a) to interfere or break consumers' viewing between programs and (b) to provide new information about products and services. The basic perception about advertisements on ITV, i.e., interactive advertisements, may be rooted in two traditional roles of television advertisements. Given those roles, advertisers should create two-way interactive, informative, and/or customized ads, instead of traditional television ads (one-way, image-oriented ads), to prevent media users from skipping commercials. Furthermore, it is necessary to convince media users that ITV

advertisements would not be static, image-oriented break-ups, but interactive, information-orientated sources available at media users' discretion.

Another important thing is that the success of ITV advertisements could depend on whether advertisers guarantee to protect consumer privacy (Yankee Group Report, 2003). Consumer concerns about interactive advertisements, especially privacy infringement issues, were found here to affect their intent to adopt ITV in the near future. Actually, it seems very difficult for advertisers, agencies, or service providers to persuade consumers that they will be protected from privacy infringement, since even an ITV function to skip commercials could easily provide information about what kinds of shows keep consumer attention, as well as what commercials get zapped the most. Hence, ITV adoption would necessitate some regulatory rules to ensure consumer privacy.

Theoretical Implications

Functional Similarity Principle

The functional similarity principle suggests that if a new medium is perceived as being able to satisfy the same needs fulfilled by old media more effectively, it will, to some extent, substitute the old. There was no clear-cut evidence regarding whether the principle held across various innovations (Rogers 1995). Thus, my study attempted to empirically test the principle within the context of interactive television (ITV). A concept of functional substitution was utilized for my study. The concept has been actually treated as one of most useful concepts in analyzing pairs of media, although others failed to explain the adoption patterns among a wide range of media and communication technologies (Atkin 1993).

My study found that ITV would be a substitute for other competing media (i.e., existing television services and videocassette recorders) and a perceived supplement for

the Internet. Meanwhile, an individual's perceptions about such functional substitution were not significant predictors affecting intent to adopt ITV. In other words, the perception that ITV would be a substitute for other media did not cause media users to intend to adopt ITV.

The fact that consumers' perception about ITV's functional substitution did not lead to their intent may be incurred by a prototype situation where ITV will be available in the near future. In other words, although consumers perceive ITV as a substitute of other media, they may hesitate to adopt ITV because ITV is not available at present. Therefore, my study presents the following implication:

> My study partially supported a functional similarity principle using a concept of perceived functional substitution. Although ITV was perceived as a substitute for some other media, the perceived functional substitution did not cause intent to adopt ITV services.

The fact that ITV services were perceived as substitutes for the two functionally similar media (i.e. existing television services and videocassette recorders) left the functional similarity principle with only modest support.

Influential Factor

Most innovation adoption literature suggested that the strongest factor in adopting innovations was the relative advantages of (or attitudinal motives for) the innovations (Eastlick 1991; Garramone et al. 1986; LaRose and Atkin 1998a; Li 2001; Lin 1998; 2001). My study confirmed that attitudinal motives (i.e., expectancy-value attitudes) are indeed powerful predictors of media adoption, as previous studies contended. However, those motives were not the strongest factor to affect media adoption. Rather, the level of

perceived control over resources (i.e., affordability and intrinsic value) most strongly affected consumer intent to adopt ITV in the near future. Based on the findings, my study provides the following implication:

> The most influential factor in increasing or delaying the adoption rate of an innovation may be the perceived control over an innovation adoption, rather than attitudinal motives for the innovation.

In this sense, the finding of my study was inconsistent with previous studies (LaRose and Atkin 1998a; Lin 1998). The reason of inconsistency may be due to ITV itself, which is at the prototype stage. To explain exactly such inconsistent findings, it is necessary to retest the relative importance of those two variables (i.e., motives and perceived behavioral control), as applied to other media contexts. This issue should be addressed in future research.

Limitations

There are some limitations to my study. First, this study was limited to consumer's perceptions about an interactive television (ITV) prototype. As a matter of fact, even if this empirical study could find evidence that some ITV applications have the potential to succeed in the marketplace on their own added benefits, ITV service diffusion might be adversely affected by a number of issues beyond consumer perceptions. External factors (actual retail price, standardization for set-top box and middleware, economic situation, regulation, etc.) could be very crucial in new media diffusion studies. Therefore, in order to predict an ITV prototype more accurately, it is necessary to conduct an in-depth examination of such external variables.

Second, the research model in my study incorporated a perceived functional substitution (PFS) concept, which had low convergent validity and low inter-item reliability. Three indicators of that concept (i.e., interest in innovative functions, media usage level, and satisfaction with other media content) did not develop a statistically meaningful scale for that concept. Specifically, although the satisfaction indicator was not a significant predictor of PFS at a pretest, that indicator was included in the questionnaire of a main survey. This was because my study needed at least three indicators to measure accurately a main concept such as PFS. In fact, my study should have revised one of indicators (either interest or satisfaction) or replaced it with an alternative as a way to increase convergent validity. The indicators of PFS should be retested in further research. In addition, a direct measurement scale for PFS concept was not effective in terms of its reliability. One of three items was time spent on other competing media, which was not closely correlated with the other items (i.e., substitute and replace; see p. 76). This might affect the correlation analyses between overall PFS and each of its three indicators. Overall, for these reasons (i.e., low convergent validity and low inter-item reliability), the model might fail to explain the precise relationships among significant variables in the model. Thus, refining the PFS scale is necessary in further research.

Third, this study had limited external validity. Although my study used a probability sample of 1,500, the sample was not completely representative of a population of general Internet users (see Table 5-2, p. 90). Only in terms of gender and family size did the profile of the sample approximate the actual profile of the population, i.e., the Internet users in the U.S. The findings of my study, thus, are somewhat limited

for their generalization to the population. In addition, my study failed to control levels of awareness about an ITV prototype. This means that the level of awareness, to some extent, influenced the overall findings. In other words, overall findings of my study could change depending on the degree of respondents' awareness of the prototypical ITV. In this sense, these findings were also limited in terms of external validity, i.e., generalizability. In future studies, it is necessary to investigate the relationships of awareness and other perceptual variables (e.g., attitude and perceived behavioral control) without the level of awareness being held constant.

Fourth, the validity of mail survey used in my study was in doubt. The survey measured individual's perceptions about an ITV prototype, assuming that the prototypical ITV features will be available in the near future. In such situation, the survey might not accurately measure consumers' actual perceptions about ITV services. The survey also provided a brief description about an ITV prototype, in which non-existing (e.g., modifying angles and chatting while watching TV) and existing ITV features (e.g., personal video recorders and video-on-demand) were mixed together. That mixture could make it hard for respondents to accurately answer the questions about ITV prototype service functions. For example, the attitudes toward, and interests in, current personal video recorder (PVR) services such as TiVo or ReplayTV were relatively high, compared to non-existing service functions. This finding cast doubts on the accuracy of collected data for my study.

Lastly, my study covered only high-end technologies in testing a functional substitution hypothesis. The extent to which technologies are developed (e.g., how interactive they are in terms of their functions) could significantly influence the

substitution of other old media, i.e., the adoption of a new medium. Thus, it is valuable to apply both low- and high-end technologies to the ITV adoption context. To achieve this task, future studies need to have a perceptual map indicating which media are low- and high-end technologies, and how close ITV is positioned to those low- and high-end technologies.

Further Studies

The influence of some variables on an innovation adoption depends on the nature or characteristic of the innovation. For example, it appears that demographics play an especially important role in determining adoption of hardware-based "communication" technologies such as computers (Dupagne 1999). Hence, it is important to identify the nature of an innovation, in order to examine accurately the roles of various variables in affecting the innovation adoption. However, given the increasingly blurred distinctions among a variety of technologies, it is very hard to locate the truly independent nature of a technology (Atkin et al. 1998). For this reason, further diffusion studies should continue to examine possible interrelationships among such technologies and pay more attention to the overlapping areas among actual application usage.

It is still necessary to refine innovation concepts such as a discontinuous innovation and a substitute for other competing media, and empirically test the interrelationships between discontinuousness and substitution. For example, further studies can test whether or not ITV services are perceived as a discontinuous innovation, and then whether that perception might affect consumer ITV adoption as a substitute for other competing media. Furthermore, in case of the substitution, it could not necessarily mean the opposite of supplement for other competing media. Thus, further studies

should make it clear if there may exist an alternative to a continuum ranging from substitution to supplement.

As mentioned earlier, interactive television (ITV) requires advertisers to understand both the attractiveness and potential risks of interactive advertising applications. Advertisers should build in-depth knowledge about possible interactive ads on ITV, in order to take advantage of such a challenging situation effectively. Nevertheless, little has been thus far known about either alternative formats or contents of ads that have appeared on ITV services. Thus, it is imperative to explore new commercial formats that can embrace more creative advertising content on ITV.

Finally, my study used age, education, family size, and income level as demographic and socioeconomic characteristics, in order to differentiate an innovator group from a non-innovator group. Ethnicity can also be one of influential factors to classify adoption intention groups. In other words, cultural traits derived from ethnicity may help to explain the level of innovation adoption, and further to segment consumers for target-advertising (or promoting) ITV services. Thus, ethnicity will be considered as one of demographics in future innovation studies.

APPENDIX
QUESTIONNAIRE

Interactive Television Survey
Department of Telecommunication
University of Florida P.O. Box 141262
Gainesville, FL. 32614-9936

April 21, 2003

Dear Mr(s). Participant,

The rapid development of new technology may soon make interactive television a reality of consumers. We are examining emerging technologies in new media. This survey is part of new media research being conducted at the University of Florida. Your responses to this survey will be helpful in furthering my understanding of new forms of mass communications.

You will be asked to answer survey questions about your experiences regarding your media use. You will also be asked to provide some demographic information about yourself, though none of it will refer to your identity. You can expect the survey to take approximately 15 to 20 minutes to complete.

There are no anticipated risks or benefits associated with your participation. You may withdraw your consent and choose to discontinue your participation in the survey at any time without penalty. You may also feel free to leave any question blank that you do not wish to answer. There will be a little compensation for your participation directly from us, though we greatly appreciate your time and effort. We give you one dollar bill for the participation. All of the information you provide will be confidential to public, meaning your identity will not be pro vided to any public under any circumstances. Data will be kept confidential to the extent provided by law.

Your participation in this study is completely voluntary. There is no penalty for not participating. You have the right to withdraw from the study at anytime without consequence. If you have any question or suggestion about this survey, please do not hesitate to contact us (2026 Weimer, 374-8228) or UFIRB Office, Box 112250, University of Florida, Gainesville, FL 32611-2250; ph 392-0433.

I have read the information provided above, and I have received a copy of the study description. I voluntarily agree to participate in this survey as described.

_____
Participant's Signature

_____
Principal Investigator's Signature

INTERACTIVE TELEVISION SURVEY
UNIVERSITY OF FLORIDA

This survey examines emerging technologies in new media. The survey consists of five parts, each of which has 4-10 questions. Your responses to those questions will be helpful in furthering our understanding of new forms of mass communications. We appreciate your sincere answers in advance.

Part I

Types of media technologies are listed below. We would like to know about your typical use of current forms of some media technologies. Please mark your answer(s) with an X in the bracket next to the answer. If specified as "choose or answer all that apply," please mark all that you can answer.

1-1. Which of the following television services do you use? (Choose all that apply)

[ ] Cable -basic only
[ ] Cable -expanded basic (if applicable)
[ ] Cable -basic and premium
[ ] Cable -digital (with set-top-box)
[ ] Satellite –DirectTV
[ ] Satellite -Others
[ ] None of the above

1-2. Do you own any of the following media devices or services? (Choose all that apply)

[ ] VCR (Videocassette Recorder)
[ ] DVDs (Digital Video Disc) Player
[ ] Dial-up Internet access
[ ] High-speed Internet access
[ ] TiVo or any replay TV
[ ] WebTV/UltimateTV/AOLTV
[ ] Video game console (Playstation, Xbox, etc.)

1-3. How many hours do you spend using or watching the following media in a typical week?

	Never	1 or less	1 to 3	3 to 5	5 to 7	7 to 9	9 over
Cable	0	1	2	3	4	5	6
Satellite	0	1	2	3	4	5	6
Other TV Service	0	1	2	3	4	5	6
Radio	0	1	2	3	4	5	6
Newspapers	0	1	2	3	4	5	6
Magazines	0	1	2	3	4	5	6
Internet	0	1	2	3	4	5	6

1-4. How many tapes or titles do you rent or purchase in a typical month?

	Never	1 to 2	3 to 5	6 to 8	9 to 11	12 over
Video Tape	0	1	2	3	4	5
DVD	0	1	2	3	4	5
Game Title	0	1	2	3	4	5

Part II

The rapid development of new technology may soon make interactive television (I TV) a reality for consumers. Please mark your answer with an X in the bracket.

2-1. Please mark the terms that you have heard of before. (Choose all that apply)

- [ ] ITV (Interactive Television)
- [ ] VOD (Video-On-Demand)
- [ ] PVRs (Personal Video Recorders)
- [ ] HDTV (High Definition Television)
- [ ] IPG. (Interactive Program Guide)
- [ ] Online Video Game on Television

2-1-1. What is I TV?

If you like to watch movies, you can order and watch them anytime by selecting video-on-demand from a drop- down ITV menu bar. It is possible to record, store, and play-back TV programs you are watching. It is similar to video-cassette recorders, but easier to operate. Some interactive programs also enable you to play along with game shows, to play video games with your neighbors while instant-messaging them, and to send e-mails to others.

2-1-2. How can we use ITV?

When interactive programs are available, you can see some icons appear in the upper right corner of the screen or on the drop-down menu bar. You can just simply press the icons if you want to access information about specific programs or buying some products and services on the TV.

In order to develop ITV with the most desirable features, a few sentences about I TV are presented below. We would like you to think about those I TV features or functions, and then let us know your interest in them. Please mark your answer with an X in the box next to the number. The lower the number you mark, the less interested you think you are in each feature of I TV. DO NOT change your answers if you learn new facts from the subsequent questions.

2-2. How interested are you in the following services or functions of ITV?

	Not at all interested		Somewhat interested		Extremely interested
Recording TV programs in an easier way	1	2	3	4	5
Watching a variety of channels	1	2	3	4	5
Searching programs by title, genre, actor…	1	2	3	4	5
Automatically recording programs relevant to my tastes	1	2	3	4	5
Instantly replaying TV programs	1	2	3	4	5
Ordering movies on demand anytime	1	2	3	4	5
Using different camera angles to view programs	1	2	3	4	5

Access the Internet on TV	1	2	3	4	5
Pausing live TV programs	1	2	3	4	5
Skipping commercials	1	2	3	4	5
Play along with others on TV game shows	1	2	3	4	5
Using chat rooms to interact with other viewers	1	2	3	4	5
Taking polls/voting	1	2	3	4	5

Please mark your answer with an X in the box next to the number according to how much you disagree or agree with each item. For example, if you strongly disagree with the statement, mark X in the box next to the number "1" after that item. If you strongly agree with the statement, mark X in the box next to the number "5" after that item.

2-3. To what degree do you agree with EACH of the following statements?

	Strongly disagree				Strongly agree
I often influence people to adopt a media service	1	2	3	4	5
When other people choose a media service, they turn to me for advice	1	2	3	4	5
I often persuade others to buy the media service that I like	1	2	3	4	5
When I consider subscribing to a media service, I ask other people for advice	1	2	3	4	5
I don't like to talk to others before I decide to subscribe to a media service	1	2	3	4	5
I feel more comfortable making decision to subscribe to a media service, when I have gotten other people's opinions on it	1	2	3	4	5

2-4. To what degree do you agree with EACH of the following statements?

	Strongly disagree				Strongly agree
I like to try new products	1	2	3	4	5
I like to explore new technologies	1	2	3	4	5
I like to participate in social activities	1	2	3	4	5
I enjoy interacting with my neighbors	1	2	3	4	5
Compared to my friends, I am in good shape financially	1	2	3	4	5
I like to learn about new ideas	1	2	3	4	5
I like to keep up with new technologies	1	2	3	4	5
I am willing to take risks in order to try new things	1	2	3	4	5

We would like to know about your level of satisfaction with each content of the following media technologies. Please mark your answer with an X in the box next to the number. The lower the number you mark, the less satisfied you think you are with each medium; the higher the number you mark, the more satisfied you think you are with each medium.

2-5. How satisfied generally are you with EACH of the following media content? (Answer all that apply)

	Not at all satisfied		Somewhat satisfied		Extremely satisfied
TV programs (cable or satellite or others)	1	2	3	4	5
Web content (over the computer or TV)	1	2	3	4	5
Rent or purchased VHS movies	1	2	3	4	5
Rent or purchased DVD movies	1	2	3	4	5
Rent or purchased game titles	1	2	3	4	5

Part III

Following are several questions concerning your beliefs and evaluations about interactive television (I TV). Please mark X in the box next to the number that your answer matches.

3-1. How likely do you believe each of the following things would take place? Assume that you use or watch interactive television (ITV) in your home as soon as it is available.

	Extremely unlikely		Somewhat likely		Extremely likely
Using or watching I TV in my home enables me	1	2	3	4	5
To control or handle TV programs in a easier way	1	2	3	4	5
To watch more shows that fit my tastes	1	2	3	4	5
To obtain a variety of information about programming	1	2	3	4	5
To save time or increase convenience by doing a several things at the same time (e.g., surfing the Web on TV programs)	1	2	3	4	5
To be more entertained	1	2	3	4	5
To communicate instantly with others unlike with traditional television	1	2	3	4	5
To be free from advertisements	1	2	3	4	5
To decrease exposure to advertisers' commercial purposes	1	2	3	4	5

3-2. How important would each of the following items be to you? Assume that you use or watch interactive television (I TV) in your home as soon as it is available.

	Not at all important				Extremely important
Controlling TV programs in a easier way	1	2	3	4	5
Watching more shows that fit my tastes	1	2	3	4	5
Getting a variety of information about programming	1	2	3	4	5
Saving time by doing several things at once	1	2	3	4	5
Being more entertained	1	2	3	4	5
Instantly communicating with others unlike a traditional TV	1	2	3	4	5
Being free from advertisements	1	2	3	4	5
Having personal privacy violated	1	2	3	4	5

The following items have to do with the difficulty of purchasing or subscribing to interactive television (I TV) services, or with the possibility that you could do it. Please mark X in the box next to the number that your answer matches.

3-3. For me to purchase or subscribe to ITV service in the near future would be

Impossible	1	2	3	4	5	Possible

3-4. If I wanted, I could purchase or subscribe to services in the near future

Definitely true	1	2	3	4	5	Definitely false

3-5. How much control do you believe you will have would be I TV services in the near future.

No control	1	2	3	4	5	Control

3-6. It is mostly up to me whether or not I purchase when you purchase or subscribe to I TV or subscribe to I TV services in the near future.

Strongly agree	1	2	3	4	5	Strongly disagree

Following are several questions with respect to your expectations about interactive television (ITV). If you strongly disagree with the statement, mark X in the box next to the number "1" after that item. If you strongly agree with the statement, mark X in the box next to the number "5" after that item.

3-7. Do you disagree or agree with each of the following statement? Assuming that you use or watch interactive television (ITV) in your home as soon as it is available.

	Strongly disagree				Strongly agree
ITV services would be very expensive so that I could not afford to pay for them	1	2	3	4	5
ITV would be worth extra money that I would be willing to pay beyond what I pay now for my current media use	1	2	3	4	5
ITV functions would be too complex to handle easily	1	2	3	4	5
ITV would require a lot of time spent learning how to use it	1	2	3	4	5
ITV services would be provided with some technical difficulties (e.g., slow speed of connection)	1	2	3	4	5

3-8. Price would make it

Much easier	1	2	3	4	5	Much more difficult

for me to purchase or subscribe to I TV services in the near future.

3-9. Technical difficulties or concerns would make it

Much easier	1	2	3	4	5	Much more difficult

for me to purchase or subscribe to ITV services in the near future.

3-10. Lack of knowledge about how to use I TV functions would make it

Much easier	1	2	3	4	5	Much more difficult

for me to purchase or subscribe to I TV services in the near future.

Part IV

Following are several questions about comparing interactive television (I TV) with other competing media (e.g., cable, the Internet, VCR, DVD players, and video game consoles). Please mark X in the box next to the number that your answer matches.

4-1. How do you feel about interactive television (ITV) services in the near future? For me to purchase or subscribe to I TV services in the near future is

Harmful	1	2	3	4	5	Beneficial
Pleasant	1	2	3	4	5	Unpleasant
Good	1	2	3	4	5	Bad
Worthless	1	2	3	4	5	Valuable
Enjoyable	1	2	3	4	5	Unenjoyable

4-2. What do you think of I TV services, compared to other media? Are ITV services a substitute for EACH of the following media? Assume that you now use or watch ITV services.

	Extremely Supplementary				Extremely substitutable
Cable (or satellite or others)	1	2	3	4	5
Videocassette recorder (VCR)	1	2	3	4	5
Digital Video Disc (DVD) player	1	2	3	4	5
Video game consoles or devices	1	2	3	4	5

4-3. Do you disagree or agree with EACH of the following statements about ITV services? Assume that you now use or watch ITV services.

From my perspective, each of the following media services will be replaced by ITV services

	Strongly disagree				Strongly agree
Cable (or satellite or others)	1	2	3	4	5
Videocassette recorder (VCR)	1	2	3	4	5
Digital Video Disc (DVD) player	1	2	3	4	5
Video game consoles or devices	1	2	3	4	5

4-4, Could you rate the increase or decrease in time spent on EACH of the following media? Assume that you now use or watch ITV services.

	Time increase a lot of		The same time as usual		Time decrease a lot of
Cable (or satellite or others)	1	2	3	4	5
Videocassette recorder (VCR)	1	2	3	4	5
Digital Video Disc (DVD) player	1	2	3	4	5
Video game consoles or devices	1	2	3	4	5

Part V

In the last section, we would like to know how likely you are to use interactive television (ITV) services in the near future. Additionally, we would like to know about you. We appreciate your effort in completing the survey.

5-1: How likely is it for you to purchase or subscribe to ITV services in the near future?

	Extremely unlikely		Somewhat likely		Extremely likely
I intend to purchase or subscribe to ITV services	1	2	3	4	5
I will try to purchase or subscribe to ITV services	1	2	3	4	5
I plan to purchase or subscribe to ITV services	1	2	3	4	5

5-2. What is your gender?

☐ Male
☐ Female

5-3. What is your age?

- [ ] 17 or under
- [ ] 18-24
- [ ] 25-34
- [ ] 35-44
- [ ] 45-54
- [ ] 55-64
- [ ] 65 or more

5-4. What is your highest level of education?

- [ ] Post Graduate (e.g. Ph.D., MD, ED, JD...)
- [ ] Master's Degree
- [ ] Bachelor's Degree
- [ ] Attended/Attending college
- [ ] Graduated High School
- [ ] Attended High School
- [ ] Eighth Grade or less
- [ ] Other (please specify)

5-5. How many people live in your household (including yourself)?

5-6. What is your martial status?

- [ ] Single
- [ ] Married
- [ ] Living with a Partner
- [ ] Widowed/Divorced

5-7. What is your annual household income?

- [ ] Under $15,000
- [ ] $15,000-$29,999
- [ ] $30,000-$44,999
- [ ] $45,000-$59,999
- [ ] $60,000-$74,999
- [ ] $75,000-$89,999
- [ ] Above $90,000

5-8. What is your profession?

- [ ] Managers/Business/Sales
- [ ] Professional
- [ ] Homemaker
- [ ] Cashiers/Customer Service
- [ ] Clerical/Administrator
- [ ] Factory Worker
- [ ] Engineers/Technician
- [ ] Other (please specify)

5-9. What is your home zip code?

5-10. Please use the space below to give us your opinions about this survey?

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